SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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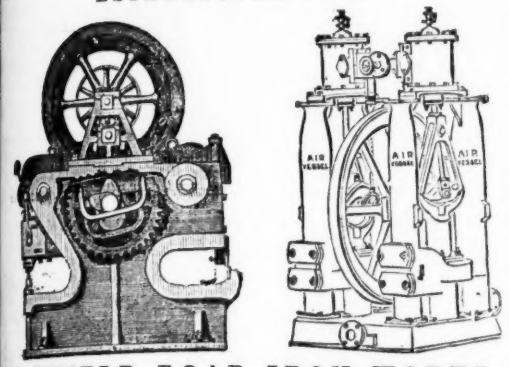

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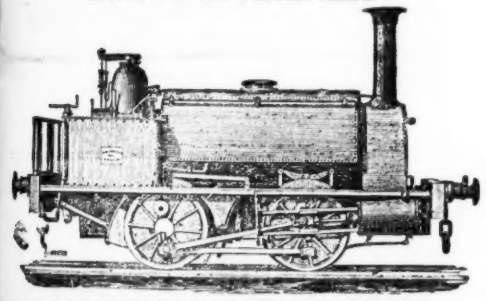

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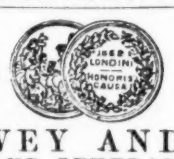

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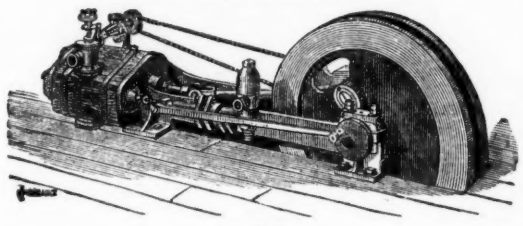

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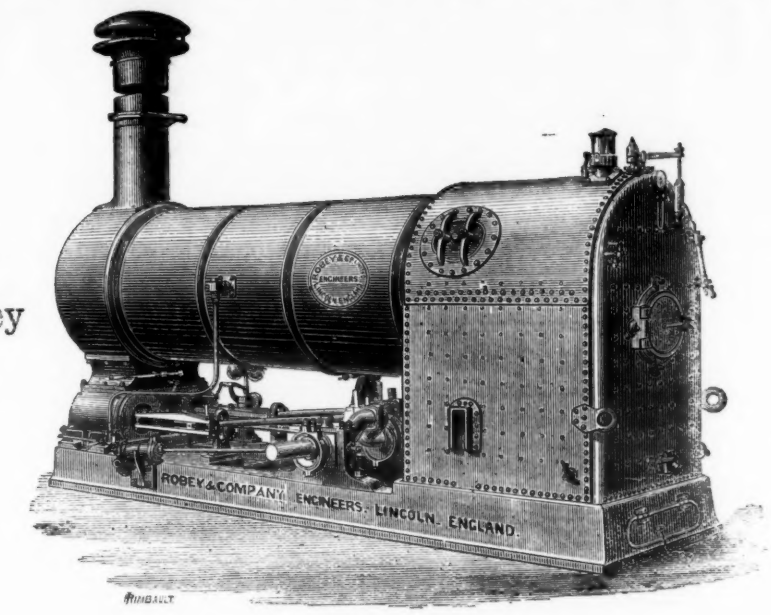

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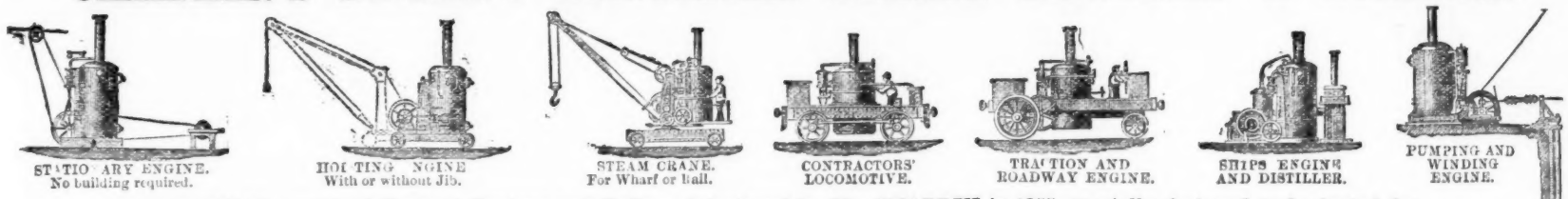
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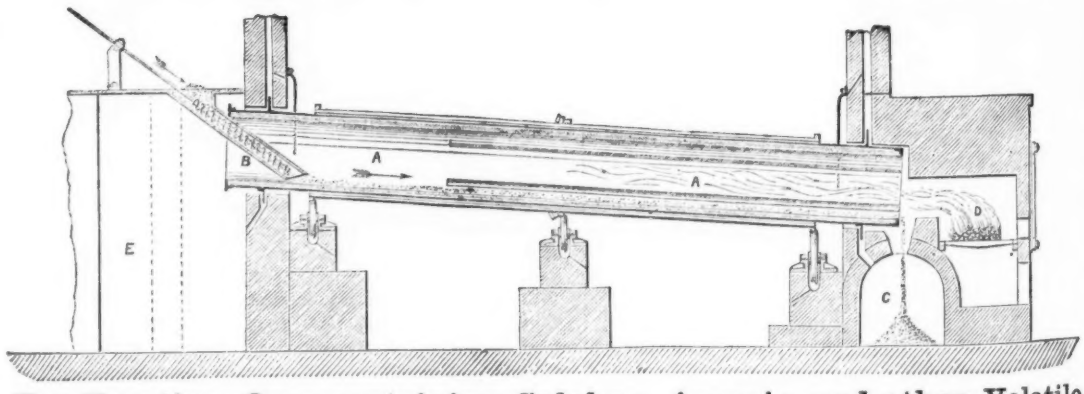

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MANUFACTURERS of every description of ROUND and FLAT ROPES of any length for COLLIERY, RAILWAY, AGRICULTURAL, SHIPPING, and other purposes, and guaranteed of the highest standard of strength.

Best Selected Charcoal Iron, est Crucible Cast Steel, and extra strong Improved Steel Round and Flat Wire Ropes; Compound-laid non-rotating Flexible Ropes, in Iron or Steel for small gear and sinking purposes; Best Selected Charcoal Iron Guide Ropes; Galvanised and Plain Ropes for capstans, crabs, suspension bridges, canal towing, &c.; Patent Steel Plough Ropes; Galvanised Signal and Fencing Strands; Copper Rope Lightning Conductors; Steel, Iron, and Copper Sash Cords; Picture Cords; Russian, Italian, and Manilla Hemp Round and Flat Ropes; White and Tarred Hemp and Flax Spun Yarns; Round and Flat Rope Pulleys and Patent Springs for same; Galvanised Wire Rope for Ships' Standing Rigging; Russian, Italian, Manilla, and Coir Cordage; Towlines, Warps, Service and other Lines for Shipping Purposes; Ships' Rigging fitted by experienced workmen.

D., C., and S. beg to call special attention to the advantages to be derived by adopting their EXTRA STRONG IMPROVED STEEL ROPES, for lifting heavy loads in deep mines, also in hauling from long distances; a considerable reduction is effected in weight, friction materially reduced, and an extra amount of work got out of the rope—a rope 8 lbs. per fathom being equal in strength to an iron rope 20 lbs. per fathom, or an ordinary steel rope 12 lbs. per fathom.

Original Correspondence.

JOTTINGS ON THE METALS.

By Thos. H. Miller, Secretary of the Nascent Copper Company (Limited).

COPPER.

Kupfer (German), *Cuivre* (French), *Cuprum* (Latin).

Copper is yellowish-red in colour, with a hardness superior to that of silver, but inferior to that of platinum, is both malleable and ductile, hence it may be drawn into wires, and beaten into plates, and so tenacious that one of the former may be drawn as fine as 78-1000ths of an inch in diameter, and will bear a weight of upwards of 300 lbs. without breaking. The fracture is somewhat hackly, and the density of the commoner sorts is about 8·6, the best reaching so far as 9·0. On rubbing or warming a very peculiar and disagreeable odour is emitted, and to the taste it is nauseous; it is an excellent conductor of heat and electricity, and fuses at a point about which gold will melt—a low white heat of about 1196° Fahr., at or above which it burns with a beautiful light-green flame, depositing a small portion of a grey pulverulent oxide, this collecting as a kind of soot in the chimneys of furnaces, thus accounting for the loss so much noticed in smelting operations. Copper was used by the Greeks, under the name of *Chalcos*, to mix with tin in the manufacture of swords, knives, &c. The combination of the oxides with acids in the form of salts are numerous, curious, and important, of which I will speak hereafter, proceeding to show from whence, and by what methods, the metal is produced. Copper occurs in the greatest number of places, and in the largest quantities, being found sometimes in a metallic state, and may be crystallised in cubes, octahedrons, or dendritic, or it may be amorphous. The ores are extremely numerous, the principal being copper pyrites (or the sulphides of copper and iron), and nitreous copper (sulphide of copper), a full description of which will be found further on. The alloys of copper are, upon the whole, of more importance than those of any other metal, they ought, therefore, to be considered more minutely than I have the power to do. With gold it increases the hardness of same, and from that fact, and without interfering much with the colour or malleability, is adopted for alloy of the coin of the realm; with silver (as in our money and likewise in plate) it is associated, and, as in the preceding, increasing the hardness and without materially debasing either colour or malleability; with tin its union in certain proportions produce an alloy which is principally employed in bell making, and bronze ornaments, and cannon. In bell-metal (as this alloy is called) the proportions are 4 to 1 of tin; in gun-metal about 10 to 1; with about 33 per cent. of tin (with the addition in some cases of zinc, silver, or arsenic), an alloy is formed which will take a splendid polish, and is admirably suited to the reflection of light, it is, therefore, called speculum metal. We can trace this combination as far back as Pliny's time, mention being made in one of his works of nearly the same thing in the construction of mirrors. Arsenic: this is somewhat difficult to associate with copper, owing to the volatility thereof; when arsenic is present to about 2 per cent a perfectly white, ductile, and malleable alloy is formed; with iron an union is made when copper is largely in excess, forming (with addition of a little zinc) a hard and tough alloy sufficiently malleable to work into domestic furniture—to wit, candlesticks, &c.; it takes a good polish, white in colour (much resembling silver), and is the favourite *tutenag* of the Chinese; with zinc, brass is formed, and is known, according to the proportion of both metals, by the names of tinsel, pinchbeck, tombac, Prince Rupert's metal, and Dutch gold, the latter of which may be beaten into exceeding'y fine sheets, and the whole contains more copper than exists in common brass. Mannheim gold consists of 3 parts of copper to 1 of zinc. Packfong, another production of China, is composed of copper, nickel, and zinc, similarly employed in this country under the name of German metal.

Ores of Copper.—Native copper: colour a clear red.

How occurring, and general appearance.—It occurs in mass, disseminated in grains and leaves, also capillary, moss-like, dendritical, and crystallised—the regular forms being the cube, octahedron, and the pyramidal dodecahedron, the crystals being small, and generally implanted in each other. Lustre: glistening and metallic internally, and when cut or rubbed acquires a high polish; its hardness is not so very great, nor is it at all elastic, on the other hand, it is malleable and flexible, and still tough and frangible. Occurs in veins and beds in primitive and secondary mountains, generally accompanied by some of the other ores. Fracture: hackly. Specific gravity: 7·2 = 8·8.

Vitreous Copper.—Colour rather mysterious, something between dark lead and blackish grey, being sometimes covered with a steel-coloured tarnish.

How occurring, and general appearance.—The crystals are generally of a small size, and show the cube, octahedron, and hexahedron, exhibiting internally a glistening metallic lustre; is somewhat brittle, and easily frangible. Occurring in mass, disseminated or crystallised, in beds and veins in primitive and secondary mountains, accompanied by pyrites and other ores. Fracture: uneven, passing into conchoidal and fine grained. Specific gravity: 4·1 = 5·4. Before the blowpipe it gives a metallic bead of steely colour, which is attracted by the magnet. Composition: when pure it appears to be a simple sulphide, or, more properly speaking, a disulphuret, containing, according to Chevenix—copper, 81; sulphur, 19 = 100: although about 2½ per cent. of the ore consists of iron. Chemical peculiarities: an effervescence, with nitrous acid.

Variegated Copper.—Colour: between copper-red and brown, but by exposure to the atmosphere acquires a tarnish which changes from reddish to violet, afterwards blue, and finally green.

How occurring, and general appearance.—It occurs in mass, disseminated, superficial, or crystallised in octahedrons, and found in many parts, more particularly Cornwall, Sweden, and Norway. It takes a polish by friction, and gives a reddish-coloured streak; it is soft, rather brittle, and easily frangible. Fracture: small and imperfect conchoidal. Specific gravity: 4·9 = 5·4. Before the blowpipe it melts readily without smell or vapour. Composition: sulphur, iron, oxygen, and copper are the component parts of this ore, the proportions, however, differing in the spots where it is found for instance, one from Siberia gave—copper, 58; sulphur, 19; iron, 18; oxygen, 5 = 100. Another from Norway—copper, 69·5; sulphur, 19; iron, 7·5; oxygen, 4 = 100. Chemical peculiarities: effervescing, with nitrous acid.

Copper Pyrites.—Colour: between brass yellow and gold yellow, approaching more to the latter as the ore becomes richer in copper.

How occurring, and general appearance.—It occurs in veins in primitive, transition, and secondary rocks in most countries in the world; found in mass, disseminated, superficial, stalactitical, clustered, reniform, and crystallised in tetrahedrons, and the derivative of the iron and dodecahedron, with crystals generally small and imperfect, and surface thereof smooth and shining; that of the other varieties is rough and glimmering. It is brittle, and with difficulty gives a feeble spark with the steel, but may be cut with a knife very easily; it is readily distinguishable from iron pyrites (the only substance with which it is likely to be confounded) by the pale brass yellow colour and superior hardness of the latter. Copper pyrites is the most abundant and generally diffused of any of the ores of the metal. The surface is often iridescently tarnished. Fracture: coarse and fine grained, uneven, nearly conchoidal, and imperfectly foliated. Specific gravity: 4·41. Before the blowpipe, on charcoal, precipitation takes place, with emission of sulphureous vapour, and melts into a black globule, which, with an increase of heat acquires the colour and lustre of copper. Composition: copper, 41; iron, 17·1; sulphur, 45·1 = 103·2.

White Copper.—Colour: between silver white and brass yellow.

How occurring, and general appearance.—It occurs in mass, or disseminated; internally it has a slight metallic lustre, yielding readily to the knife, is brittle and easily frangible. Fracture: coarse and fine grained, uneven. Before the blowpipe it yields a white smoke and an arsenical odour, and melts into a blackish slag. Composition: about 40 per cent. of copper, the rest iron, arsenic, and sulphur. Specific gravity: 4·5.

Grey Copper.—Colour: steel-grey, passing into iron-black and dark-grey, some varieties inclining to yellow and others present superficial iridescent colours.

How occurring, and general appearance.—It occurs in mass, disseminated, investing, or crystallised in regular tetrahedrons and their modifications, in veins, in slate, and some other of the newest primitive rocks, and in beds in the transition rocks, being accompanied by copper pyrites, galena, manganese, spathose iron, and sometimes by malachite. The crystals are small and with shining surfaces. It gives a black or reddish-brown powder, is moderately hard, and easily frangible. The uncrystallised varieties generally contain also antimony, silver, and lead, but in very variable proportions, and, as a general rule, those specimens giving a reddish-brown streak are the richer for silver. Fracture: coarse and small grained, uneven, inclining to perfectly conchoidal. Specific gravity: 4·46 = 4·36. Composition: pure grey ore gives, according to Chevenix—copper, 52; iron, 33; sulphur, 14 = 99. Of the other varieties, we have some from Germany giving 5 to 38 per cent. of antimony, but neither lead nor silver; on the other hand, we have three specimens, giving—

Copper	29·3	31·36	16
Iron	12·1	3·3	13
Sulphur	12·7	11·5	10
Antimony	36·9	34·09	16
Silver	0·7	14·77	2·25
Lead	—	—	34
Silex	—	—	2·5
Alumina	1·1	—	—
Arsenic	4·0	—	—
Total	96·8	95·02	93·75

[*To be continued in next week's Mining Journal.*]

PROFITABLE MINING.

It is impossible to deny the fact that great numbers of capitalists in the United Kingdom doubt or entirely disbelieve that there is such a thing as profitable mining, although there have within the memory of the oldest been "a good few," as the Scotch say, who had a sort of rage for mining speculation. Sometimes the direction taken was to one description, and then, without sufficient reasons to justify the change, it took another form. Sometimes one country was the theatre of adventure, and was after a time given up for another. Half a century ago Cornish tin mines were in vogue. After the discovery of the Devon Great Consols by Josiah Hitchins, copper mining was fashionable with the class to which we refer, and there was a disposition to explore Devonshire. When gold was found in California and Australia, persons having a passion for mining readily took up companies searching for the precious metal, or professing to have found beds of alluvial gold or reefs of auriferous quartz. Later on, Colorado, Nevada, and the Mormon State witnessed a rush for the other precious metal—silver. Coal and iron were the treasures in 1870-74, until even a coal famine ensued from its enhanced price, and now a section of the community disposed to seek for underground treasures prefer lead and silver-lead undertakings, and Wales and the Isle of Man have received their especial attention. But the great majority of capitalists shun mines as an investment, and quote a certain authority in justification who is alleged to have said "Mining as a whole does not pay." We doubt whether the authority from whom the alleged quotation was said to have been taken *viva voce*, ever uttered that laconic sentence, and therefore he need not be named, but the doctrine itself was actively disseminated, and most extensively believed. It is, of course, the desire of the *Mining Journal* that no such mischievous faith should be received, and it is an injury to capitalists to believe it, for there has been and there is, and for long will continue profitable mining within the area bounded by "the four seas."

It is often said, "see what complaints are continually made of the depression in the mining interest," "the low price of metals," "the number of mines in Cornwall shut up," &c. We admit that this is not always mere croaking. The mining interest is sometimes depressed when the commerce of the country generally is so, and of late it has felt the effects of a universal depression in business. It would have been miraculous if it did not, and any man, whether holding shares in a metal bearing or mineral property, or anyone who prides himself for "holding aloof from that sort of thing," would be an uncomprehending and incomprehensible person who could expect otherwise. But it has lately been shown in the columns of the *Mining Journal* on two occasions that our commerce for the superior metals—tin, lead, and copper—have suffered less than any other branches of our trade, iron having been the only part of the business in metals showing exceptional results. These statements were proved by a careful collation and comparison of the Custom House returns.

If capitalists hearken too closely to the outcry of shipbuilders, shipowners, shippers, cotton spinners, calico printers, and above all, farmers, they will never invest in shipping, manufactures, or agriculture, and the outcry of "bad times" is more frequent and intense among all these classes than among miners. The late Rev. John Burnet used to say that an average Englishman had always three grievances—"the weather, the times, and the Irish." It has grown into a proverb that John Bull has always the privilege of grumbling. Perhaps this is less the case than it used to be, and will be less so still as men become more educated and reasoning. Whatever ground of grief the present protracted dulness of general business the British miner may possess, it behoves all men who invest money to remember that there has been "profitable mining," and to recognise that there is still "profitable mining."

The history of tin mining in Cornwall has been as diverse in its action as ancient in its origin, and persons prejudiced against it may be defied to prove that any other branch of business has been as lucrative unless some other department of mining. Cornwall produced vast wealth, and added much both of riches and renown to the country by her tin mines before steam ships, railroads, and foreign loans were thought of.

In a number of the Quarterly Mining Review, published just 45 years ago, these words occur—"The country of Cornwall has been celebrated for its mineral productions from periods of the most remote antiquity, nor does it seem improbable that the first established intercourse between ancient Britain and the then civilised world arose from the demand for tin, which then, as now, was produced abundantly." In the Mining Quarterly, published a few years ago by Mr. John B. Reynolds, an article appeared from the pen of an old and valued correspondent of the *Mining Journal*, the late Captain Matthew Francis, admirably showing that for 2000 years tin production in Cornwall was profitable, unless during some intervals of civil war, pestilence, and modern financial panics. It is perfectly astonishing what fortunes have been made by Cornish tin mines. Take a single district, that of Lelant, it is now comparatively neglected, although it is certain that there is rich ore ground there, which when the price of tin improves will be opened up. Lelant Consols yielded 100,000*l.* in dividends; Trencrom, 150,000*l.*; Reeth Consols a qurater of a million; Wheal Kitty, 300,000*l.*; Wheal Margaret a like sum; Wheal Mary a still larger sum than that; Balnoon about the like amount; Providence, 430,000*l.*; and Wheal Reeth near 600,000*l.* In other districts the results have been similar. In the district of Redruth there are Dolcoath and Cook's Kitchen, which have yielded vast returns, and did space allow a complete review of the profits of tin mining in Cornwall it would vindicate that department of such enterprise from all deprecations, compared with other enterprises commercial or manufacturing.

Very large profits have been obtained by lead mining. Take ten mines, the aggregate wealth realised from which has been prodigious. Roman Gravels, Minera, Great Dyliffe, Van, Tankerville, West Chiverton, and Foxdale. These mines, on an aggregate capital of 800,000*l.*, have paid in dividends more than thrice the sum—at least 2½ millions. The aggregate market value of dividend-paying lead mines in England and Wales at the close of last year was only a little less than 1½ million, and it is now probably twice the amount. At the last distribution Great Laxey paid a dividend of 50 per cent., besides carrying forward 1000*l.* to the reserve fund, which now amounts to 6860*l.* Last year the distribution to the shareholders and the sum placed to the reserve account amounted to 31,000*l.* The day before the general meeting the company sold 100 tons of lead for 2357*l.*, and the day after they sampled another 100 tons. Thirteen years ago the company started with a capital of 60,000*l.*, and they have divided among the shareholders 300,000*l.*; the value of the mine is now 300,000*l.*, showing that the original capital has multiplied fivefold. The Van Lead Mine has paid dividends of more than a quarter of a million, and the market value of the company's property is 600,000*l.*, whereas only 4*l.* 15*s.* each has been called on the 15,000 shares, which constitute the share capital of the company. Tankerville began with a capital of 72,000*l.*, the dividends have been 50,000*l.*, and the property is worth in the market 144,000*l.* Roman Gravels had a capital of 90,000*l.*, and has distributed 69,000*l.* West Chiverton, on shares of 12*l.* 10*s.* each, has distributed 53,000*l.*, and these shares are now in the market valued at 20*l.* each. Minera, the original capital of which was 45,000*l.*, has distributed 576,000*l.* Foxdale has paid 250,000*l.* on 70,000*l.* On some future occasion we shall show that copper and spelter have also yielded great results. From what other description of investments, commercial, manufacturing, agricultural, financing, or Government credits could such benefits be derived? We are justified, therefore, in maintaining that there is such a thing as "Profitable Mining."

WAR, AND METALS.

Sir,—The absorbing question of the day is War! That we shall be drawn into the strife is all but certain, and with many the issue is hailed with satisfaction. To England war means the active championship of the seas and the expenditure of money. It is alike futile and unimportant to discuss the why or wherefore of the conflict—defeated politicians, pamphleteers, and demagogues have doubtless been to blame, and done great mischief; still, Russia is the bugbear, and must encounter, "as it has encouraged," the weight of the contest. The hug of the Bear is strong in the North, but its hold will relax in warmer climates, and no one can doubt the result to Russian Cæsareanship in awaking the warlike legions which will be led forth in battle array to stem the torrent of its invasion. Confusion, I say, to all such vacillating autocrats.

With war in immediate prospect, if not already in act, we may be pardoned in discussing the probable effects on metals—as regards coal, the consumption will doubtless be increased, and enhanced prices obtained. The Navy will require more fuel, while home production can alone be relied upon. Cotton textiles may become even to a greater extent paralysed than at present; but, on the contrary, our factories will become full of work—steamships will be required in quick and rapid succession; engines of locomotion (sea and land) and of every other description will be in request. Manufactured iron, steel, copper, tin, lead, and zinc will be in universal demand, and as indispensable to the exigencies of the times as grain and meat are to the well-being and sustenance of mankind. Already copper is hardening, tin is more than sustained at quoted prices; lead is firm, while war will call into requisition at greatly improved prices English manufactured iron and steel.

The revelations of the past two to three years have shown us to what purposes the foreigner has applied the proceeds of British loanable money, and thanks to these revelations neither Russia, Italy, Austria, or Hungary will obtain any further advances. If Russia in 1855-6 could not drive 60,000 European soldiers out of the Crimea, how can she hope to master the fanatical and unquenchable ardour and fire of the Musselman in the face of broken faith, jesuitical intrigue and hypocritical Christianity, coupled with a bankrupt exchequer, an enervated and weakened commercial emporium, a divided Ministry, and an irresolute Emperor; and pray add to the catalogue the condemnation of all Europe, the sympathy of no one, and the canker of treachery knawing at their very vitals?

If war comes, the sooner the better. England was never better prepared, and it is full time that British commerce, industry, and expansive enterprise should be freed from the crippling influences of Russian arrogance, restless territorial acquisitions, and impious Christian professions. England need not go far to seek friends; the rich and powerful can always command allies, while war must in evitably favour miners and their productions, while only a slight rebound will favourably affect such neglected properties as South Crofty, West Seton, South Condurrow, Tincroft, Dolcoath, West Tolgus, Agar, New Consols, Pateley Bridge, and West Pateley Bridge.

R. Tredinnick,
City United Club, Ludgate Circus, Oct. 18. Consulting Mining Engineer.

THE FRONTINO AND BOLIVIA GOLD MINING COMPANY.

Sir,—The heavy fall which has taken place in these shares during the last few weeks—from 50*s.* to 35*s.*, or 30 per cent.—naturally causes some alarm among shareholdes, who have been led to expect by the recent action of the board in taking power to declare quarterly dividends that a permanent dividend-paying mine had at last been established.

Without doubt such would have been the case but for the unfortunate revolution which has broken out in the United States of Colombia. This, however, should not cause much anxiety, as those who are acquainted with the country know well that such revolutions occur almost annually, are generally of about only two or three months' duration, and do comparatively little harm beyond the temporary stoppage of trade, so that, although the present revolution is located in the province in which our property is situated, there is every reason to expect it will soon be over, and that the only harm to the company will arise from the manager being unable to remit monthly to England the gold obtained from the mines, but will have to keep it till peace is restored, and as it is already reported that one battle between the Government and the rebels has been fought with unusually sanguinary results (for that country) the end is probably not far off.

The last report from Mr. White shows the mines to be in a most satisfactory state, and shareholders may, therefore, expect that directly the revolution is over the accumulated gold will be sent on to England, and the delayed dividends forthwith declared. Although the delay is just now unfortunate, still it is not sufficient to account for such a depreciation in the value of the shares, and it is to be hoped that holders will not further part with shares which when the petty warfare is over will again command a high premium.

London, Oct. 18. ——— Cheerful.

THE LATE NEWFOUNDLAND MINING COMPANY (NOW THE LA MANCHE COMPANY).

Sir,—Having observed a notice in one of the St. John's newspapers of a strong probability of La Manche Mine returning a dividend this summer, and the new company having been in operation four months, it may be interesting to some to have an approximate idea as to the expenses and the results during that period. The pile of ore matter accumulated during the winter, previous to Colonel Feilden disposing of the mine to the La Manche Company, was computed by the mining captain to contain 25 tons of lead ore, besides which there was about 3 tons dressed or partly dressed on the lead floor. Since which time some 27 tons, the men say, has been prepared for the market (*vide* results); for the first month allowances must be made for loss of time in unwatering the mine, and the few hands to dress and render marketable a supposed 25 tons of vein matter, the pay roll amounting from about 130*l.* to 150*l.* a month for the last three months. We will take a rough average of 120*l.* per month for the four months. With this explanation we will now see my view of the costs and the results:—

ROUGH ESTIMATE OF COSTS.

Four months' pay roll (say) at 120*l.* per month	£480	0	0
Consumption of coal, material, &c., at (say) 40*l.* per month	160	0	0
Deterioration in value of machinery and plant (say) 100*l.* per month	400	0	0
Interest of Col. Feilden's mortgage of 12,000*l.* (say as before), at 10 p. ct.	400	0	0
Directors' and secretary's fees, offices, &c. (say) 600*l.* per annum	200	0	0
Agents' commissions, &c. (say) 120*l.* a year	40	0	0
Interest on capital—an unknown quantity.			

RETURNS.

30 tons 15 cwts. lead, shipped, dressed, and ready for market (say) value at 14*l.* per ton at mine	£430	0	0
Profits on store (say) 25*l.* per month	100	0	0

Now, again, a few remarks may be made to explain items that might not probably be understood—"Deterioration of value of machinery," &c., computed at 100*l.* per month. Now, the valuation of this material was put down at 6000*l.*; had it been in fair repair 10 per cent. per annum would have been a proper estimate, but from the want of funds and other causes it has become much dilapitated.—"Interest on Capital:" So little having been seen, and the news as to working capital not yet come to hand, an estimate cannot be included,

but should suppose the funds very small, as the men have, it is said, nearly two months' wages to receive, although promised, I understand, [month'y] payments. In all justice to the men at present working the mine, it cannot be the case that they have only raised from 5 to 8 tons in the four months. Some great mistake must have been made when the pile of vein matter was estimated at 25 tons. Still, again, the men who raised it in the winter (before the La Manche Company was formed) must have some credit, but it would be fair to say some 6 tons per month have been raised, with an average per month of (say) 12 to 14 men and some boys.

These figures and statements, if at all correct, would show that La Manche Mine cannot be worked to advantage without a capital of from 10,000*l.* to 12,000*l.*; besides it is believed that many improvements and facilities for bringing the ore to surface in quantity could be made, also measures taken to prevent the constant flooding of the mine (very important), the many ways of taking advantage of the water power, and other numerous alterations—in fact, a thorough reorganisation.

HENRY BRADLEY.

MINING SPECULATION HALF A CENTURY SINCE COMPARED WITH THE PRESENT.

SIR,—As the year 1876 will soon close, and 1877 open, it will be instructive to look at the state of things at this time in 1826 and the opening of 1827. There were then 127 joint-stock companies registered in London, and having offices here, independent of about one-third of that number having their direction chiefly in Manchester, Liverpool, Leeds, Newcastle, Glasgow, and Edinburgh. Of the 127 companies having head-quarters here 44 were mining companies, 20 gas, 14 insurance, and 49 miscellaneous, so that the mining companies were nearly as numerous as miscellaneous, and more numerous than those for any other purpose whatever, a circumstance which will, probably, surprise many of the readers of the Journal to know; and mining companies were also more than one-third of all the joint-stock companies taken together. Of course, there were many mines worked on the Cost-book System in Cornwall not comprised in those here referred to, but in this notice we have to do with those the chief management of which was centred in London. The capital of these 127 companies was 102,781,600*l.*—a vast sum at that early stage in the history of joint-stock companies. The amount paid was, however, comparatively small—15,185,950*l.* This is explicable, however, from the fact that most of the companies had not been long formed. The value of the shares in the market was but 9,303,950*l.* This is accounted for as the monetary, commercial, and investing public were still feeling the effects of the great panic of 1825. The shares which represented this 102,000,000*l.* of money were 1,618,340, showing that shares for small sums, such as 10*l.*, 5*l.*, and 1*l.* now so much in vogue were then scarcely thought of. The amount of calls to which the holders of this stock were liable was no less than 87,595,650*l.*

These figures, although differing in some degree from Wettenhall's List for 1826-7, may be relied on as at least approximately correct. The aggregate value of the shares at the close of 1826 is, probably, the only class of figures where the slightest error will be found, as it was impracticable at the time to ascertain the exact value of the shares in many of the companies. All the amount of the share capital had not in various cases been issued. The total capital of mining companies, with which we have at present to do was 26,776,000*l.* Perhaps few persons will be prepared to hear that so large a sum as 26,750,000*l.* of share capital in mines having their committees in London existed 50 years ago, yet such was the case. The amount paid up on mining shares was greater than that paid up on the whole miscellaneous list, for the former was 5,455,100*l.*, and the latter 5,321,850*l.*, and the paid-up capital on mining shares was much more than one-third of the whole paid-up capital in joint-stock companies, and, of course, half as much as that in gas, insurance, and all others put together. The liabilities on those mining shares were 21,320,900*l.* The number of mining shares was 358,700. The average subscription per share was about 7*l.* 10*s.*, that on miscellaneous about 65*l.*, that on gas about 50*l.*, and that on insurance somewhere between 50*l.* and 60*l.* From this it would appear that, whatever might be the case in other directions, mining shares were issued at a comparatively small price half a century ago, just as they are now. How many excellent mining companies there are now with the share price as low as 5*l.*, and even 2*l.*, and now the shares of the Bodidris Mining Company, with one of the richest lead mines in Wales, are but 1*l.* each. A list of the names of the mining companies of that time would bring out names familiar to the columns of the Journal, and the acquaintance of captains and investors—such as "Cornwall and Devon," "Cornwall United Hills," "East Wheal Music," "Gwennappe," "Royal Stannary," &c.

The largest share capitals were in the following mines—General South American, 2,000,000*l.*; British Iron, 2,000,000*l.*, afterwards reduced to 1,000,000*l.*; Anglo-Chilian, 1,500,000*l.*; Anglo-Columbian, 1,500,000*l.*; Anglo-Mexican, 1,500,000*l.*; Chilian, 1,000,000*l.*; Chilian and Peruvian, 1,000,000*l.*; Columbian, 1,000,000*l.*; Castello, 1,000,000*l.*; Haytian, 1,000,000*l.*; Imperial Brazilian, 1,000,000*l.*; Mexican, 1,000,000*l.*; Potasi le Paz, 1,000,000*l.*; Paseo Peruvian, 1,000,000*l.*; Rio de la Plata, 1,000,000*l.* It will be seen from these figures that there was an absolute rage for South American mines. Besides a considerable list, mainly South American, had a share capital of 500,000*l.* To Cornish mines a very small capital was devoted, in amounts of 500*l.*, 10,000*l.*, 12,000*l.*, &c. The offices of these companies were all held within a furlong of Capel-court, and in the same localities where the offices for mining companies are now situated. The year 1826 was, however, an unfortunate one for mining speculation. In consequence of the inability or unwillingness of the shareholders to pay calls many of the companies had to be dissolved, the capital of which in the aggregate was close upon 6,000,000*l.*, and a vast amount of money was lost to the public. The readers of the Journal can perceive the less fortunate directions which mining speculation took from the names of those companies—Anglo-Peruvian, Alliance, Alliance Granite, British Lead, Guanaxuato, Gold Coast, Grand Cornish Union, Goonearl, Hoomeavy, Imperial Manganese, Polbreen, Royal Sisters, Royal United, South Wales, United Chilian, United Pacific. Notwithstanding those misfortunes, and the difficulties of companies that were not broken up to obtain satisfactory answers to calls, a number of mining companies were projected with an aggregate capital of rather more than that of the companies dissolved. The names of the projected companies were Aberdovey Copper and Lead, British Lead, Brazilian, British, Antrim Iron and Coal, Crown, Consolidated Dartmoor, Imperial, Lintat Manganese, Northern and Weld, South Wheal Virgin, Tamar Granite, United Provinces, and Tamar Consolidated.

It will be seen that the public were pretty well cured of their fever for South American mining investments; that for North American mining did not set in for many long years after. Some of the projected companies at this time 50 years ago set out with an enormous amount of capital. The Brazilian 2,000,000*l.*, the United Provinces 1½ million, the Crown a million, and Nathan and Welsh half-a-million, while South Wheal Virgin started with 1000*l.*, and Lintat Manganese with 8000*l.* The capital in the aggregate was distributed in 80,300 shares, most of which were from 50*l.* to 100*l.* each. Only one—Lintat Manganese—issued shares of a very small amount—4*l.* each.

The aggregate capital of all the joint stock companies projected in that year was of great magnitude, being 143,610,000*l.*, in 2,535,380 shares. Some of these projects "came to the wall" the following year, and others a little later on; few survived for any length of time. In addition to these, 150 companies issued prospectuses without naming the amount of capital required, or the sum on each share demanded, and of which at the close of 1826, at all events, no information could be obtained. Some of them certainly went further than the issue of the prospectus, but in the different mining and stock Exchange circulars at the close of 1826 and the opening of 1827, little was known of them by brokers and the general public. Several of these companies were for working alleged mining properties in Cornwall, Ireland, and Wales. It was estimated that the capital of the companies issuing their prospectuses with so much zeal was about 700,000,000*l.*, in less than 1,000,000 of shares, but this at best was only intelligent conjecture by persons having good opportunity of pushing enquiry.

During the years 1824 and 1825 there were 624 joint-stock companies projected, of which 74 were mining. The capital for those which proposed mines was 38,370,000*l.*, in 537,200 shares. The capital for all the projected schemes was 372,173,100*l.*, in 5,963,220 shares. Who can wonder at the financial and commercial disaster of 1825 and the beginning of 1826, and the vast amount of misery they entailed, although the Bank Act, commonly called Peel's, but really that of Jones Lloyd, and Ricardo (young Peel's rising influence being merely put forth to carry their plans), was in full operation. The Act was passed to prevent panics, and here was the first signal failure.

The following review of the period by an experienced observer, published at the beginning of 1826, explains the spirit which then prevailed, and affords a key to the calamities experienced:—"A majority of the companies formed in the years 1824 and 1825 were of a nature adapted only to individual enterprise, as by the formation of a company many useless offices were created and expenses entered into which would prevent the possibility of any profit accruing to the shareholders, while the insignificant capital in many cases proposed indicated some sinister motive on the part of the projector." This was not the case of 1826, for the capital asked for was in almost every case immense, as has been shown in this article. The speculations of 1876 are well known to the readers of the Journal, and they can compare or contrast the doings of to-day with the doings of 50 years ago, which this article faithfully chronicles.

City, Oct. 19. J. J. R.

THE NASCENT COPPER COMPANY (LIMITED).

SIR,—I have placed in a rather lengthened, but at the same time simplified, manner the main points or plague spots this company will obliterate, and consider that to proceed further in the matter is useless if my previous explanations are not clearly understood. With your permission, however, I would repeat the heads of the letters you have favoured me by inserting, and for abbreviation have divided the whole subject into eight paragraphs or clauses:—

1. MINING AS HERETOFORE EXISTING.—Always performed in one certain manner and with one certain object—the sinking of shafts, driving of levels, and searching for and proving lodes—this constitutes mining, but what is all this work done for? To find rich bunches or shoots of ore. Now, the point I have been driving at is this, that mining has up the present time been carried on in a general way at a most decided loss, and for the reason that the rich bunches being so few and so far between, an immense expanse of ground has to be travelled before material of a sufficiently rich quality to raise is reached in driving through or on the course of the lode (the latter is most universal where and when possible); it is not to be supposed, however, that the rock comprising the interval between these rich morsels is entirely barren; on the contrary, it may be strongly impregnated with metal throughout the whole run (or, at any rate, near to or on the lode) to too small an extent, however, to pay for raising, the cost of transport, and smelting in furnaces. If, therefore, it were possible to quarry out a lode in bulk, and treat the entire mass in a manner to obtain an average profit per ton, the speculative character of mining would be to a very great extent abolished.

In point of fact the only questionable point with investors would be as to the real existence of a vein in or through the land to defray the expenses of discovering which, they would be invited to subscribe in the hope of almost immediate remuneration. It is a sure and certain thing, however, that it would dispense with the almost constant three-monthly calls we hear of being made on some well known mines, for, on the opening of the vein if unprofitable to work, the property could either be abandoned or tested at a greater depth, and it must be a poor copper lode that does not give 1 per cent. This quality, although nothing extremely glowing, can be raised and worked by the Nascent process with advantage, and the rich bonuses met with from time to time would swell the profits. To prove the poorer parts of a lode and its heretofore considered valueless class, look at the stuff thrown back to stull (or to be explanatory, left by the miner underground as dirt) in deep mines, the cost of raising necessitating the bringing to surface something more remunerative in manipulation than simply rocky substances or attle. This discarded stuff contains a great portion of metal, but to too small an extent to smelt by the ordinary methods. By the Nascent process it might prove satisfactory, the great thing being, with low-class ores generally (to obtain dividends), to work a large quantity per day; we depend on doing at least 10 tons, or 60 tons per week, which will leave a handsome profit, and when it is considered that the same number of hands will turn over three times that quantity, the intelligent reader will perceive the gain made thereby.

2. COSTS TO BE PAID BY THE ADVENTURER.—These are so numerous that I do not wonder at small capitalists getting disheartened. A mine was taken up by a party of gentlemen (four or five), and after working for some four years were obliged to abandon the property because of the expenses. Firstly, engine boiler and pumps and connections—the two former would not do the work put upon it, however, and a water-wheel was added; the result of the attachment may be guessed. The engine either went too fast for the wheel, or *vice versa*, with the loss of half the teeth of the cogs at each disturbance, and the consequent waste of time in repairing the same. The water was quick, however; a large quantity of ore was sold, until at a certain depth the ground changed and showed mundic and spots of beautiful copper By this time all the partners but one were cleared out, and he did not feel himself justified in spending his all on the mine; it was, therefore, given up, with its costs for deeds of surrender and filling up the shaft and leats. This is one instance; I could give many like it. If, however, the Nascent had been then in use that mundic in question, to which in this case there was no no end seemingly, could, no doubt, have been treated profitably, for I believe it gave nearly 1 per cent. of copper. Still, the costs of mining are very heavy, although they need not be. Let us take a few charges as at present made. Firstly, breaking underground. Well, that is necessary, and must, therefore, stand. Secondly, raising to surface—that is likewise compulsory. Thirdly, spalling—this ought to be kept going, but the attendant on the crusher can do a deal towards it. Fourthly, picking; this can be dispensed with altogether. Fifthly, cobbing; this is likewise an unnecessary operation. Sixthly, crushing must be done. Seventhly, jigging; this need not be. Eighthly, carting or barging; this may be necessary, but not to the extent that miners go; take 100 tons of 2 per cent. ore, for instance, the adventurer would send away the whole; we shou'd, on the contrary, only part with about 2½ tons of precipitate containing the same value as the 100 tons did before. Ninthly, quay dues are decidedly unnecessary so far as we are concerned, as the works can take almost any quantity. Tenthly, samplers' fees, &c. (quite an unprofitable payment) swell the list, and thus we see that by the sale of ore to the Nascent Copper Company (Limited) miners will only have to adopt five out of the ten operations spoken of above, one of which would be performed by the company under arrangement—the third. As this speaks for itself, I go on to—

3. PAYMENTS.—These by smelters are at very long dates by bills given, perhaps, some three months after the ore is ready for disposal, and then for a further three months before the cash is to be obtained, thus the smelters have time to extract the metal and throw the copper again in the market. With this company, if bills are given at all, they will be for only a month, or perhaps shorter, by the expiration of which the metal would be in as forward a state as if three months were taken.

4. WASTE CAUSED BY DRESSING.—This is so evident that I need not discuss the matter beyond advising those having doubts to visit a copper mine and examine the skimpings and tailings, and my argument as to the existence of 1 per cent. throughout the lodey parts will be conclusively endorsed.

5. The Nascent Copper Company (Limited) is registered under the Companies Acts, 1862 and 1867, with a capital of 15,000*l.* divided into 15,000 shares of 1*l.* each. The calls are small, 5*s.* per share, and the usual long intervals between the payments thereof.

6. The company intend to remedy the blots on mining by preventing the waste of money in dressing operations by purchasing the lode matter as raised, and by treating the whole by the Nascent process.

7. Smelting process as ordinarily performed is most expensive, and it is so requisite that the miner should grind the ore to such a size and bring it to such a place that smelters have no trouble whatever. I have laid forth the different processes, both wet and dry, most extensively, and, therefore, need not trouble my readers any further on this point.

8. By the adoption of the Nascent process properties hitherto valueless would become saleable, and by the powers obtained under the Memorandum of Association this company are at liberty to acquire and work mines, and to purchase ores and materials. Thus by the support of this undertaking all parties are served well, the labouring class obtain employment by the re-working of mines abandoned for want of a class of produce that by the sale thereof will reimburse the adventurer, and to those possessing mineral properties will be in a position to dispose of the same to advantage.

Finally, I would respond to a few of my private correspondents through your columns. To "J. B.," of Warrington, pray accept my thanks for the wishes conveyed in your letter of the 7th, the form of application is already sent off, and hope it has reached its destination before the time of this going to press. "S. W. R.," of Reigate: You can pay up in full if you so desire, under discount. "F.S.," of Birkenhead: The process has now had sufficient trial to prove its value, and by your investing in the shares of this company you will be enabled to dispose of the ore referred to. I should recommend your subscribing without delay, as the list may not be open much longer. "A. de T.," of Nice: Allotment letter will be forwarded on closing of share list.

In conclusion, I would recommend enquirers to adopt the plan suggested by these correspondents, to whom it will afford me pleasure to respond in the manner shown above, begging, however, that I may not be consulted as to the standing of this or that mine, as some have expressed a wish to do, desiring that they would refer their difficulties to a respectable broker, who will at once satisfy them. I have not received any intimation from either "Observer" or "Investor," and I am only waiting for them to favour me with their names to reply to the queries they raised.

80, *Bishopsgate-street, Oct.* 17. THOS. H. MILLER, Secretary.

EXTRACTING NICKEL FROM ITS ORES.

SIR,—From the recent discoveries of rich nickeliferous ores in New Caledonia and elsewhere some interest naturally attaches to improved methods of treating them, more especially when they emanate from such thoroughly sound metallurgists as Messrs. Christofle and Bouilhet, of Paris. The ores of New Caledonia to which they are more particularly giving their attention consist chiefly of silicates of nickel and of magnesia, containing varying quantities of iron and alumina; average samples give between 18½ and 18¾ per cent. of protoxide of nickel. The peculiarity of these ores which distinguishes them from the ores hitherto treated in Europe consists in their containing neither sulphur nor arsenic, but a remarkable quantity of magnesia in varying proportions, the total weight of the magnesia and of the nickel is, however, almost invariably about equal, these two bases by reason of the laws of isomorphism being substituted one for the other.

The nickel ores of New Caledonia contain considerable quantities of iron in the state of silicate and of oxides. The iron is not combined with the nickel, but forms a separate combination, either stratified in alternate layers with the silicate of nickel, or diffused in the mass and without apparent order, but so as to be easily recognised by the ochreous colour of the ore. The mode of treating the ore by melting it directly after having pulverised it is open to the objection that the whole of the iron contained in the ore forms a combination with the nickel regulus or the fused nickel from which it is very difficult to eliminate it. In fact, in order to effect this elimination it is necessary either to resort to a puddling process at a high temperature, which, in order to scarify the iron, causes considerable quantities of nickel to pass off in the scoria, and produces great and costly waste, or to employ a process of refining by solution, which is as long and costly as if the whole of the ore were subjected to the direct action of acids.

To obviate these difficulties Messrs. Christofle and Bouilhet first treat the ore by a wet process to remove the iron and treat the cleansed nickel ore by a dry process. In separating the iron the ores are sized and washed in order roughly to separate the portions rich and poor in nickel respectively, each being afterwards treated separately. In the separation of the ferruginous matters from the nickel the silicates and oxides of iron are first attacked and dissolve before the silicate of nickel, thus enabling the iron to be separated from the nickel in this first treatment by a wet process. By means of a methodical lixiviation with hydrochloric acid in suitable apparatus by the customary systems, the iron is dissolved out by means of the acid. The solutions thus obtained contain the whole of the iron, the magnesia, and a certain quantity of nickel. As soon as the pulverised ore loses its ochreous tint, and the silicate of nickel appears with its beautiful green colour, the operation is to be stopped and the ore tested to ascertain if it still contains iron. If it is found to contain iron it is to be again digested with fresh acid, care being taken not to dissolve too much of the nickel. If the ore is then found not to contain any more or but a small quantity of iron it is washed and dried, and the water in which it has been washed is put aside to be treated in order to separate the nickel which it contains.

After the process of solution is completed the solution will contain iron, nickel, and magnesia, and they are treated in such manner as to separate the iron and the magnesia, and to collect the nickel by one of the processes of treatment hereinafter described; other acids than hydrochloric acid may also be employed for the purpose of separating iron from the nickel contained in Caledonian ores, in order to enable the ores to be subsequently treated by the dry process. For example, tartaric acid, acetic acid, or oxalic acid may be used, providing that the salt of iron obtained is soluble. In this case oxalic acid is preferred by reason of its possessing the advantage of forming at the same time an insoluble salt of nickel, and in consequence of the whole of the nickel remaining in the ore, which result does not take place when hydrochloric acid is employed.

When oxalic acid is employed the ore reduced to a fine powder is treated hot, and in sufficient quantities with a concentrated solution of oxalic acid in suitable vessels; after heating for several hours when it has been ascertained that the insoluble powder does not contain any more iron, the liquid is run off and the ore washed. The waters containing oxalate of iron, magnesia, and oxalic acid in excess are afterwards treated by milk of lime. The oxalate of lime produced is digested with sulphuric acid, in order to revivify the oxalic acid, which may then be re-utilised in the manufacture. An oxalic acid is formed when an organic substance is heated in presence of matter capable of imparting oxygen to it, the result will be similar whether the acid be prepared beforehand or obtained by the reaction of the elements, which serve for its preparation in presence of the ore.

In carrying out the subsequent dry process for the treatment of the ore, the ore after having been washed and dried and re-united with the ore resulting from the first sorting, is afterwards mixed with the quantity of pulverised wood, charcoal, and flux, suitable for producing the reduction and fusion of the metal, and a very fluid scoria. The flux which has been found to give the best results consists of a mixture of carbonate of soda and carbonate of lime, the proportions of which may be varied according to the nature of the ore and the amount of silex and magnesia which it contains; it possesses, moreover, the advantage of scorifying any iron which may still remain. Preliminary trials will indicate the proportions to be employed; other fluxes may, however, be used, such, for example, as fluor-spar, borax, vitreous salts, and other known fluxes with a similar result.

The ore thoroughly mixed with charcoal and flux is placed in successive charges and highly heated, either in a crucible heated by itself in an air furnace, or in crucibles heated in a special furnace, or in a reverberatory furnace heated directly by coal, or a gas furnace on one of the known systems, such, for example, as Ponsard's, Siemens', or others, or in any other suitable apparatus by running off the scoria from time to time, or by skimming it off with a ladle, the progress of the operation may be ascertained, and fresh quantities of mixture of ores and flux may be added, thus increasing the amount of product obtained from the operation. The result is com-

mercial nickel, which may be run into ingots, shot, and the like. Various modifications in detail are of course necessary, according as slightly different qualities of ore are under treatment, but the above will convey a general idea of the process. F. K.

City, Oct. 18.

MINERAL STATISTICS.

SIR,—About a month ago there appeared in the Journal the totals of some of our mineral productions for 1875. The balance, together with the items which make up the totals, we may, as usual, expect about Christmas. The statistics of former years include two elements—the tonnage and the price obtained; and yet on this data all sorts of comments have been made on the loss which the country has sustained from the reduction in the price of the minerals. The inferences so made may be in the right or wrong direction; but there are circumstances which tend to modify such inferences, the chief of which are wages and appliances—everything, in fact, which reduces the cost of production. And before any just inferences can be drawn from Mr. Hunt's Statistics an additional element in the data requires to be introduced, and that element is the cost of production. We have cases before us as we write of differences in the cost of production on the same mine, as well as on different mines, during different quarters, and it is, therefore of the highest importance that this element be had before drawing any inference. In copper, for example, one mine produced at the ticketing 15 per cent. ore, which we find cost A; another produced an ore with only 7·5 per cent., and cost 20 per cent. less than A; while a third produced only 5·75 per cent., and cost 50 per cent. more than A.

With such differences it is impossible to use the statistics as they stand for the purpose to which they are so often applied. The high percentage ore we have referred to is that of Buckland Down, in Devon, where the cost of production is reduced below that of many other mines by its advantageous position. We should be sorry to add to the labours of Mr. Hunt. So far as it goes his work is well done, and few men know the toil of getting up the necessary materials for such, but his work would be much increased in value if it could embrace the element we have referred to, and then we could draw just and proper inferences without the fear of falling into some gross blunder. G.

LONGITUDINAL EXTENT OF LODES.

SIR,—I find that in my last week's remarks on this subject I erred in stating that the Lechwedd-ddu lode of Dyliffe had been traced through the adjoining setts. I find that it is the Esgairgaled, or north lode, which has been so traced, and if any of your readers who are interested in the subject will take the Ordnance Map of the district and draw a line from Dyliffe west through Cafartha, Bugailyn, Hyddgen, Esgair-hir, Nant-y-nod, Pen-y-bontpren, to Tyhen, they will admit if, as is the case, a lode of the marked character of the Esgairgaled—great width, a great prevalence of hard white spar, and a north underlie—has been seen at all these places, that the continuance of a lode for a distance of at least twelve miles has been proved almost beyond the shadow of a doubt. The case with regard to the Lechwedd-ddu and Dyliffe lodes is not so clear at present, as they have not been seen between Dyliffe and Hyddgen; but, as I stated in my last, at this latter place a lode has been sunk on exactly resembling in detail, except the underlie, the Llechwedd-ddu lode, and I have just heard that a lode showing lead at the surface has been discovered in the south portion of the sett, which I am inclined to think is the Dyliffe lode proper. If this is the case, then I am of opinion that the former of these two lodes will be found to run west through Henfwlch, Cefn Gwyn, and Elgar, and the latter through Camdwrmawr, Bwlch-y-styllen, and Llawr-y-cwm bach, perhaps as far as Bronfloyd. This at present remains to a certain extent uncertain, but I think the case of the Esgairgaled lode may be taken as proved, and if one lode can be found to exist almost, if not entirely, uninterrupted for a distance of 12 miles or more, why should not more exist?—*Machynlleth, Oct.* 17. CYMRAEG.

LESSENING COST OF PRODUCTION IN CORNISH MINES.

SIR,—In these times of general depression, when metals are so very low, and Cornish tin mines have to contend with foreign countries where the ore is found in large quantities near the surface, it behoves those interested in Cornish mining to use every means to lessen the cost of production, so as to compete successfully with Australia and other tin-producing countries. With this object in view very laudable efforts are now being made to bore the rock by machinery instead of by manual labour. I most heartily wish the boring machines great success, and hope they will eventually be so improved as to enable the underground levels to be driven at less cost than by hand-labour. In the meantime, you will be good enough to allow me to state what has been accomplished at South Condurrow towards lessening the cost of production, by comparing the work done with dynamite against blasting-powder. I refer to a winze on the great tin lode below the 70 fm. level sunk with powder, and another below the 80 fm. level, on the same lode, and in almost precisely similar ground, with dynamite. I find by the books on the mine that by using powder it took, on an average, rather more than seven men ten months to sink 10 fms. 4 ft. 6 in., costing 309*l.* 5*s.* 8*d.*, and averaging 28*l.* 13*s.* 11*d.* per fathom; the cost of powder and other materials amounts to 6*l.* 13*s.* 8*d.*, being an average cost of 5*l.* 18*s.* 3*d.* per fm., which, as usual, has been deducted from the men's earnings, leaving a net balance in favour of the mines of 3*l.* 8*s.* 2*d.* per month. By using dynamite it took four men five months to sink 12 fms. 1 ft. 2 in., costing 110*l.* 11*s.* 10*d.*, average price per fathom 9*l.* 1*s.* 4*d.*, against 28*l.* 13*s.* 11*d.*, as stated above; the cost of materials, with dynamite, is 28*l.* 16*s.* 11*d.*, making the average cost per fm. 2*l.* 7*s.* 3*d.*, against 5*l.* 18*s.* 2*d.* with powder. The cost of dynamite and other materials deducted as usual leaves the average earnings of the miners for the five months referred to 4*l.* 1*s.* 9*d.* per month, against 3*l.* 8*s.* 2*d.* I might state the ground sunk with powder was done before I had control of the mine. I cannot, therefore, be accused of charging extra price for powder; on the other hand, the price charged the men for dynamite is the ordinary one as charged by the British Dynamite Company—2*s.* per lb. If it were necessary I could give other examples of dynamite over powder.

I have been induced to put out this statement in the interest of Cornish mining. I have felt, however, rather reluctant to do so, because my sons act as agents for the British Dynamite Company; but I consider with these plain statements of the work accomplished, and the saving of time and money effected, the shareholders have reason to congratulate themselves on the use of dynamite in the mines—the men also are able to do a great deal more work, and to earn more money.—*Redruth, Oct.* 18. WM. RICH.

CARDIGANSHIRE MINES, AND PARTIES CONNECTED WITH THEM, &c.

SIR,—Seeing some allusion to the late Caegynon, now North Rheidol, in last week's Journal, the writer might have known from previous letters of mine which have appeared in your valuable columns that it is now owned by a party, principally from the North of England, who have erected machinery for the re-working of it. Since my last letter appeared, however, wherein it was anticipated that the Tyn-y-fron Mine would have been added to it, I find this will not be the case, and this must alter the complexion of matters altogether, as not only is the Tyn-y-fron, in my opinion, capable of producing more ore at a less cost than the North Rheidol, but standing higher in the valley, and the North Rheidol water and water-course for working their machinery passing through it, will on the erection of their machinery be entitled to this water, and of their doing this there can be no question whatever. I may say, also, they will be able to return the water taken out of the river into it again in their own grant, so that North Rheidol stands upon anything but good ground for a bountiful supply of water—the chief thing in Cardiganshire mining. Allusion also is made to the Court Grange, where there is an excellent field of machinery put into proper repair, and I may say there is a great deal more astonishment in the neighbourhood than must exist with "A Shareholder" at its being allowed to be suspended, when the agent of the landowner (Earl Lisburne) has undoubtedly a right to forfeit the lease for non-fulfilment of contract.

Reverting to Wheal Jane, in Cornwall. If nothing were done here worse than the crediting of tin, which seems to have been raised in the mine, we should be in a much better position than we have been for a long time past. All manner of calculations as to ore raised have been made, and still go on. The raising of new capital, and spending it blindfold, driving and sinking carried on by "rule of thumb," and other reckless and careless mismanagement have brought the mines of this country to the verge of ruin, from which they can now only be rescued by parties looking to their own interest, and seeing that each and every mine where they have embarked their capital is conducted by men who can at least read and write, and have some notion of using a dial and conducting mines in a straightforward manner. ABSALOM FRANCIS.

Goginan, Aberystwith, Oct. 17.

NORTH LAXEY MINE.

SIR,—As a considerable shareholder in this mine, will you allow me to urge upon the directors and my fellow-shareholders the paramount importance of at once proceeding with the sinking of the north shaft? The agent, Mr. Rowe, has given it as his decided opinion that greater depth is only required to bring the mine into a paying concern. Why not, therefore, direct all the energy possible to this point? Sufficient capital has been subscribed to sink the shaft 15 fms. deeper; why not then at once commence doing so, even if all other operations be for a time suspended? I hope, however, that the funds would allow the driving of the south and north ends of the 136 fm. level at the same time; and as the winze sinking in the 121 is worth 2 tons per fathom, I presume this would pay for its being carried on also, but should it decrease in value then let it be abandoned. I should also recommend the suspension of all other points till we have seen the result of the sinking of the north shaft and the driving of the afore-named ends in the 136. I trust the agent and directors will at once act upon these recommendations. A HOLDER OF TWO HUNDRED SHARES.

WHEAL GRENVILLE, AND MR. LANE.

SIR,—I was not aware until I read "A Shareholder's" letter that Mr. Lane was a director or promoter of the now defunct Caegynon Mine. Would your correspondent be surprised to hear that the present manager of Wheal Grenville, and who was so strongly recommended for the post by Mr. Lane, was the manager of Caegynon? If "A Shareholder" will refer to the weekly reports of that mine, which apppeared in the Journal, he will perceive a strong likeness in them to the reports we now receive of Wheal Grenville. I give a few extracts from some of the former. "Machinery now in good trim, and working well." "Dressing going on regularly." "Everything looking well for increased returns." "Every inducement for deeper working, which would, no doubt, lead to success."

ANOTHER SHAREHOLDER.

CORNISH MINING—TRESAVEAN LODE.

SIR,—It is not unfrequently that the publication of one letter in the Journal elicits another, and, through your kind permission, such will be the case in the present instance. In the Journal of the 7th inst. I notice a letter from Capt. Simon Toy, in which he states that forty-five years ago he saw a fine gossan lode a little to the south of Trevence House, the residence of the late Mr. Michael Williams, and "it is likely that I am the only man now alive that has seen it"—"that there was a fine well of water there," &c. From the said well I have taken many a pleasant refreshing draught, and, although I never saw the lode to which Capt. Toy refers, yet I do not for a moment question its existence, for during the several years that I remained in the neighbourhood I used to notice rusty or apparently oxidised water oozing through the ground into the river opposite, and in close proximity, to the place designated by Capt. Toy, and which I doubt not proceeded from the gossan lode, which he saw; but surely Capt. Toy must fancy that forty-five years has made him a very old man, and that his then contemporaries who were about the place must have been unusually short lived, if he be the "only man now alive that saw the lode," supposing even that it had been removed or hidden at the time in question. Is it not possible that the present Mr. John Michael Williams might have seen it, for forty-five years ago he was a young man living at his father's house, and two of his servants have lately died—Thomas Brown at 94, and James Barret at more or less the same age.

At the comparative'y recent date to which Capt. Toy refers even the writer of this letter had passed many years in digging amidst the branches and the great lodes of Poldory and other adjacent mines, and at a period which much further exceeds fifty years ago than Capt. Toy's date of his having seen the lode exceeds forty he was found with his schoolfellows—as the greatest feat that they could accomplish—bounding across the above-named river, and, thank God, he believes that were he to try he could bound across it even now; and yet Capt. Toy believes that he is the only man alive who saw a gossan lode forty-five years ago. TIMOTHY COLLINS.

ROCHE MINING DISTRICT.

SIR,—This district, which was never what we call a distinguished one, is like most of the others in Cornwall in a dormant state as regards its mines, but as a china-clay district it stands in the first class. The best mine known in the district is that of Great Beam, which about 40 years ago yielded large profits, when it was worked by Messrs. Williams and Co. Afterwards another company worked it with a loss, since then it has remained idle. Miners say still that it is the best in the district—depth 130 fms. Cornubia Mine commenced about 50 years ago, and yielded profits during its working period of 15 years. Resumed by a Leeds company about 15 years ago, under the direction of the late Mr. W. H. Gray, and was worked four years—loss 25,000*l.* Resumed again in 1872, when a 50-in. steam-engine was erected, and still is *in situ*; three years were expended in the erection of machinery, &c., at a cost of 6000*l.* The company did not sink to the engine-shaft at all, which is 60 fms. deep; they merely drained the mine. In consequence of the low price of tin the working was suspended about two years ago. It is eligible for re-working, and it is hoped that when tin reaches 50*l* per ton Capt. David Cock, who purchased the machinery, will form a company for further development. It is thought by many that it is a property of value. There are two or three water-wheels there lifting 24 stamp-heads, now in use by Capt. Cock reducing tin derived from the backs of lodes.

Hallew Mine, east of and adjoining Great Beam Mine, was worked by the late Captain Webb to a depth of 20 fathoms, on two Great Beam tin lodes, which proved to yield 700 lbs. of tin in 10 tons of stuff. I have been informed that Capt. D. Cock, who is in possession of the sett, intends to work this mine in connection with the great iron lodes which are in the sett; these iron lodes are considered the best in the county. The land has been purchased by Capt. Cock. Goonbarrow Mine is idle (depth 50), but the machinery has been purchased by Capt. Cock, and is now used by him at the Imperial Goonbarrow Clayworks. The mine did give a profit when tin was at a high figure. Shelton Mine (previously called Bonney Mine) is also idle, but one of the engines is used by Mr. Lovering for pumping water, &c., out of his clay pit. Depth of mine 60 fathoms. North Bonney Mine commenced in 1871, and worked as a tin mine three years, returned about 8000*l.* worth of tin, but the lode failed in depth. The engine is now used for pumping china-clay, of which there is abundance. Rocks Tin Mine, near Goonbarrow, has been idle 20 years. It was worked several years, and yielded profit from tin returns of 20 tons per month. Castle Dinas has been tried twice, under the management of Capt. T. Parkyn. The work was on an elvan course, but the yield would not pay the cost of working with tin under (say) 80*l.* per ton. Castle Gate, Roche Consols, Bellowda Hill, Brynn, Bryn Royalton, Great Royalton (since named Tregoss), and Wheal Mary, are also idle. Several of these were worked on elvan courses, but had tin lodes also. None of these mines will pay with tin at a low price.

The Roche district is good as a china-clay producing district. I subjoin the names of those clayworks with which I am acquainted—Wheal Henry, Wheal Cock, Hallivet, Imperial Goonbarrow, Little Johns, Old Little Johns. These are under the management of Capt. David Cock, who is one of the principal owners of them. These are in full work and prosperous. Goonbarrow Claywork, the property of Messrs. Martyn Brothers; West Goonbarrow, the property of a limited Welsh company; North Goonbarrow, the property of Messrs. Nicholls Brothers; Great Beam and Crown Filley, the properties of Messrs. Hocker and Co.; Old Beam, the property of Messrs. James Knight, and Nicholls Brothers; Rosevear, the property of a Cardiff company; Wheal Fortune, the property of Messrs. Luke; Caudle Down, the property of Messrs. Bale and Co.; Rosemellyn, the property of Mr. Barrett, of London; Woon Claywork, adjoining Rosemellyn, the property of Capt. D. Cock, is about to be worked; Great St. George, the property of Mr. Bickerton, London; Creggan, now in course of develepement for tin and clay, by the Creggan Tin and Clay Company (Limited); and Great Wheal Prosper, the property of Mr. Arnall, of the North of England, are all in this district. But for the clayworks Roche district would be awfully poor. These mainly support the population; but if the strike which is threatened take place poverty and misery will result, as have resulted in the strike districts of the North of England. It is certain that in times past the labourers here had not been fairly paid, and even now the pay is little enough; but it is better for men to take what they now receive than imitate the conduct of the coal strikers. A club of clayworkers has been formed, chiefly of men working under Messrs. Stocker and Co., which they are labouring to crush by discharging all labourers who join it. The out men are under pay from the club, but the funds, I take it, will soon be exhausted, and the men will then repent of their combination. R. SYMONS.

Truro, Oct. 19.

SALES OF COPPER ORES.

COPPER ORES SOLD AT THE CORNWALL TICKETING, FOR THE QUARTER ENDING SEPTEMBER 30, 1876.

Mine.	Tons.	Amount.
South Caradon	1410	£ 8,823 15 6
Devon Great Consols	2155	6,402 19 0
West Seton	1067	4,985 13 0
West Tolgus	801	4,668 9 0
Marke Valley	1060	3,534 2 0
Crenver and Abraham	1013	3,196 12 6
Glasgow Caradon	750	3,184 4 0
Gunnislake (Clitters)	600	3,087 11 0
South Crofty	514	1,735 12 6
East Caradon	345	1,516 3 0
Hingston Down	639	1,429 14 0
East Pool	502	1,394 10 6
Brookwood	351	1,341 17 6
West Basset	322	1,304 19 0
Wheal Crebor	308	1,233 13 0
Carn Brea	238	746 2 6
Botallack	92	738 6 0
St Aubyn United	138	700 8 0
New Pembroke	119	583 9 6
Wheal Russell	262	553 3 0
Bedford United	163	541 12 6
Gawton	203	394 11 0
Tincroft	104	352 3 6
New Rosewarne	41	315 18 0
South Carn Brea	55	270 17 6
West Maria and Fortescue	118	262 7 6
Wheal Friendship	42	255 9 0
West Poldice	39	234 7 0
Carn Camborne	67	2 9 12 0
Prince of Wales	74	208 3 0
East Basset	27	196 10 6
Penstruthal	35	193 9 6
Wheal Comford	29	166 11 0
Belstone	20	165 0 0
West Godolphin	8	160 0 0
Wheal Emma	70	124 15 0
South Roskear	36	116 2 0
Wheal Agar	15	85 10 0
Killifreth	22	83 12 0
South Condurrow	52	65 18 0
Dolcoath	20	65 10 0
Cathedral	20	63 10 0
Unity Wood	12	45 6 0
West Chiverton	15	40 10 0
Ambrose Lake	20	26 0 0
South Tolcarne	7	22 15 6
Wheal Seton	7	21 17 6
Wheal Grenville	5	9 7 0
West Gorland	2	7 0 0
New Wheal Damsel	2	3 5 0

COMPANIES BY WHOM THE ORES WERE PURCHASED.

Vivian and Sons	2708	£11,741 1 4
P. Grenfell and Sons	1642	9,097 13 4
Nevill, Druce, and Co.	2159	7,291 1 10
Williams, Foster, and Co.	2028	8,441 6 1
Mason and Elkington	2455	8,382 17 0
Charles Lambert	1646	6,722 12 7
Sweetland and Co.	1437	4,202 13 4
Total	14,075	£75,879 5 6

COPPER ORES SOLD AT THE SWANSEA TICKETINGS, FOR THE QUARTER ENDING SEPTEMBER 30, 1876.

Mines.	Tons.	Amount.
BRITISH.		
Berehaven	542	£ 2,936 7 0
Knockmahon	401	2,068 16 0
Cronebane	102	193 16 0
Total	1045	£ 5,198 19 0
COLONIAL.		
Cape	2898	£59,643 9 0
Betts' Cove	1827	13,962 11 0
Union	3125	11,943 13 6
Moonta	98	1,942 17 0
Concordia	18	204 6 0
Total	7966	£87,696 16 6
FOREIGN.		
Chili	400	£ 4,871 17 6
Var	452	3,392 10 0
New Quebrada	240	3,388 0 0
Carracedo	285	2,607 3 0
Norway	424	2,000 2 0
Algerian	187	1,352 15 6
Del Soto	56	847 8 0
African	73	750 1 0
Swedish	104	340 12 0
Telhadella	24	310 17 0
Vannoni	33	252 9 0
Ivrea	26	188 10 0
Cuba Precipitate	18	106 4 0
Total	2322	£20,388 9 0
RECAPITULATION.		
British	1045	£ 5,198 19 0
Colonial	7966	87,696 16 6
Foreign	2322	20,388 9 0
Sundries	534	4,449 18 6
Total	11,867	£117,734 3 0

COMPANIES BY WHOM THE ORES WERE PURCHASED.

Copper Miners' Co.	230	£ 1,267 11 6
P. Grenfell and Sons	932	9,789 5 9
Nevill, Druce, and Co.	1115	13,254 19 3
Vivian and Sons	2644	22,031 6 6
Williams, Foster, and Co.	3606	34,122 17 6
British and Foreign Copper Company	180	3,140 15 6
Mason and Elkington	356	4,534 6 6
Charles Lambert	1256	12,141 2 6
Sweetland and Co.	447	5,276 5 6
Landore Copper Company	801	12,143 12 6
Total	11,867	£117,734 3 0

RAILWAY CARRIAGES.—The value of railway carriages for passengers exported this year was 134,803*l.*, and last year 111,069*l.*

HOLLOWAY'S OINTMENT AND PILLS—HEALTH'S DEFENCES.—None save the strongest can with impunity pass through the sudden transitions from wet to dry, from cold to muggy weather so prevalent during the late autumn and early winter months. Influenza, bronchitis, cough, sore throat, diphtheria, or quinsy will attack those most watchful of their health; but they can readily arrest any of these complaints by rubbing Holloway's ointment twice a-day upon the skin adjacent to the affected part, and by assisting its corrective action with appropriate doses of his pills. This well-known, safe, and easy mode of treatment efficiently protects the invalid both from present and future danger without weakening or even depressing the system in the slightest degree.

Meetings of Public Companies.

FULLER'S REEF GOLD MINING COMPANY.

The fourth ordinary general meeting of shareholders was held on Saturday, Oct. 14, at the offices of the company, Lombard-street, Mr. Witherby in the chair.

Mr. J. Brooke-Booth (the secretary) read the notice calling the meeting. The report of the directors was taken as read.

The Chairman said he took the chair on the present occasion in consequence of the absence of Mr. Joseph, one of the directors, who was at present in Australia. He was sorry to see so few shareholders present, but probably one reason was because the meeting was held on a Saturday, but before sitting down he would explain why it was called on that day. The shareholders would remember that at the meeting which took place this time last year a certain plan was recommended by the directors, and, after a little consultation, was adopted by the shareholders, of carrying out a system of development in the mine, and especially of connecting a shaft, called an idle winze shaft, with the long gallery or main adit level, which the directors hoped to connect one with the other. In the remarks he was about to make to-day he was not addressing exclusively the shareholders who were present, but also the large number of shareholders who were not present who might read the report, and, therefore, he somewhat enlarged upon the remarks he might otherwise have made. The arrangement to which he had referred as having been proposed and agreed upon at the last meeting had been steadily carried out during the past year—the middle winze shaft had been sunk, and the main adit level driven to meet it; and in their instructions to the manager the directors had instructed him that every effort should be made to complete the work. The directors were in hopes that by this time, or rather by the time the last letters left, the connection would have been made, and from that time the mine would be in a state to be worked, he hoped, at a profit. The shareholders were aware that the connection between those two places was decided on in a great measure because it would materially reduce the cost of working the mine, the estimated reduction of expense being about one-half. He was sorry to say that the directors had not yet heard of the connection between the middle winze shaft and the main adit level, but according to the last letters which were received only a few feet remained to be driven on July 9, and it was calculated that at the speed at which they were then going by about the present time the connection would have been made. In the course of this operation the manager had necessarily to take out a certain amount of quartz from the mine, and they would see by the auditor's report that that amount of quartz so taken out had yielded gold to the value of 1062*l*. In considering this matter they must remember that the manager had not attempted to get quartz out of the mine, but the operations had been almost entirely confined to developing the mine with the view of getting out quartz in the future. The directors had that morning received a telegram from the mine, and when he saw it he thought the shareholders would at once say that this reception of the telegram was simply a "plant" between the manager and the directors to have a telegram that morning, but he could assure the shareholders that there was no plant at all about it. (Hear, hear.) The telegram was dated Oct. 4. The shareholders were aware of four or five days in the telegraphing to Australia, the messages having to be sent a portion of the distance by steamer. The telegram was from Mr. Weston, and was as follows:—"Visited the mine; good gold; 220 ft. level not yet cut; payable stone in tunnel; require 300*l*. to test that depth; drawing for amount, protect draft." So the connection was not made on Oct. 4, but as for the rest it looked encouraging. He supposed that Mr. Joseph went up to the mine with Mr. Weston, because although the telegram came from Mr. Weston, still Mr. Joseph was to go with him. The directors had had many difficulties to contend with during the past year. They must remember that the year which they were now talking of expired about the end of June last, and in November and December there were great floods all over the colonies, which prevented stores and supplies being got up to the mine. After those floods came a drought, which lasted for four or five months of the present year, and that drought caused a great dearth of food for the horses which were employed in various works; they lost flesh, and at last became so bad that they were reduced almost to skeletons, and had to be sent down some distance where there was better food, and regularly fattened up before they could do any more work. The third difficulty consisted in the trouble which the manager had to induce the workmen to stick to their work: the workmen out there were rather a wandering and erratic lot of men, who would work for two or three weeks, and then go off to some work of a totally different character. In the course of the operations which he had spoken of about 50 tons of quartz had been taken out of the mine, besides what had been crushed, and those 50 tons had not been crushed at the date of the last letter. The manager stated in one of his letters that if he could crush those 50 tons he would mention it in the event of sending a telegram. Probably there were two or three reasons why he had not mentioned it. The one was the difficulty about the horses, and not being able to get the quartz down to the battery to be crushed. Another reason why he did not mention it might be that it did not produce sufficient results to make it worth while, although he did not think that was the case, as almost all the stone which had been got out of the mine had been of an average quality, and better than was found in many quartz mines. It was mentioned in the report that Mr. Weston and Mr. Joseph attempted to get up to the mines in December last, and he would just touch upon that subject because some of the shareholders might have no idea whatever of the difficulties of travelling from Sydney to the mine. They attempted to go up to the mine about the time of the great floods in Australia, and they had to cross one river 28 or 30 times; some of the fords were absolutely impassable, and they were obliged to come back. But it would be seen by the telegram just received that those two gentlemen had visited the mine, but the shareholders must wait for a letter before they would be able to receive any details. Looking at all the circumstances, he thought the future prospects of the mine were tolerably encouraging. They had carried out throughout the year a definite plan, and they had stuck to that plan. No quartz had been taken out of the mine except in the way of testing it, but what had been got out had made good returns—about 3 ozs. of gold per ton. He knew of no reason whatever why the shareholders should be discouraged. He could not help thinking that the mine was in a much better state than last year; they knew a good deal more about it, and they knew there was stuff in the mine, and apparently from this time the efforts of the directors would be directed to getting that stuff out and crushing it, and he hoped crushing it to a large profit. (Cheers.) There were very few subjects to be brought before the shareholders to-day; one was the adoption of the report and accounts, if the shareholders chose to adopt them; another was the re-election of two directors who retired to-day. It was doubtful whether, by the Articles of Association, there was any necessity for two directors to retire at this meeting. Of course, at future meetings they must retire, but in order to avoid all doubt on the subject two directors had retired, and being eligible offer themselves for re-election. The auditors also offered themselves for re-election, and he might say that he should have great pleasure in supporting to the utmost of his power the re-election of the auditors, because he could truly say that they were most valuable assistants in the work of preparing the accounts, and also afforded great help to the directors in many other ways. There was one subject which the directors were rather uncertain whether or not they should bring before the shareholders, but this telegram had induced him to mention it, and that was the possibility, or perhaps he ought to say the strong probability, that a small amount more money might be required during the next year for the purpose of working the mine. The directors knew by the telegram just received that the manager was going to draw on the company for 300*l*., which would reduce the available capital to something like 350*l*., so that unless the stone which was got out in the future realised something more than that, he could not see how they could avoid the necessity of raising a small amount of additional capital, but how much it should be he really could not say at the present time. However, he merely threw out the hint; he did not know that he need make any suggestion to-day as to how it should be raised, but he wished the shareholders just to bear it in mind, and think over the best means of raising additional capital. He had every hope that the stone which was got out would provide the working expenses, and provide also something more than that; but it was the duty of directors to err especially on the safe side, and be very cautious, and, therefore, as he was addressing shareholders 300 or 400 miles off, as well as those who were present, he wished them to take the matter of raising a small amount of additional capital into their earnest consideration. He hoped that, on the whole, the shareholders might congratulate themselves; certainly the position of affairs was no worse than it was, but considerably better. (Hear, hear.) In conclusion, the Chairman moved that the report of the directors and auditors, and the accounts, be received and adopted.—Mr. Yearsley seconded the resolution.

A Shareholder asked what depth was it intended to test the 300*l*. with?

The Chairman said he supposed it was the depth from the shaft to the 220 feet level. But the telegram was somewhat ambiguous in its meaning; like all telegrams it was sent without any commas or stops, and it was, therefore, somewhat difficult to ascertain its exact meaning.

Mr. Hickey said that in the auditors' report there was an expression about the purchase money; there was an unpaid balance of 2120*l*., at the same time renounced by the vendors, and he considered that the amount did not properly come under that head.—Mr. Jackson (auditor) said it had always appeared so in their books, and in the document which eventually showed a settlement with the vendors this 2000*l*. was, he thought, described as part of the purchase money, and was renounced. He thought the vendors were credited with the amount of purchase money, except 2120*l*., which remained at their credit to this year, when it was written off.

The Chairman said they could not go into that question; it was an arrangement between the vendors and the company, and had been finally disposed of, and approved and passed at the meeting held on December 24, last year. No doubt the 2120*l*. was taken into account as a set off against certain claims, and, therefore, it was no use going into the question to-day. (Hear, hear.)

Mr. Jackson said he was responsible for the accounts, but, of course, he was not responsible for the wording of that item as he found it in the books. There was a certain amount put to the debit of the business as what had been paid.

A Shareholder: The 2120*l*. purchase money not paid was given up by the syndicate.—Mr. Hickey said he had to ask a question about the Sydney accounts. There was a large sum expended every year about Mr. Weston and Mr. Gilchrist, and then Mr. Joseph, who was out there, was to receive 1000*l*. Two years ago he (Mr. Hickey) submitted a letter from a mercantile firm in Sydney, offering to undertake the agency at 2½ per cent., and he certainly thought the directors ought to have accepted that offer. He contended the company was paying the present agents a large sum of 250*l*. a year simply to copy a few letters which were sent down from the mine.

Mr. Jackson said it was a most exceptional thing for anyone in the position of auditor to remark that the accounts were deficient and unsatisfactory; but, speaking as auditor, he might state that two years ago the agents alluded to by Mr. Hickey did send home accounts which were deficient and unsatisfactory, and last year they were written to, and some description given of the kind of accounts they were to send home, and last year the directors were enabled to present proper accounts to the shareholders. The agents were also written to in the spring of this year, asking that the accounts should be made out in the same form, but no attention was paid to this. The great objection was that whilst a large sum (3700*l*.) had been spent in wages, which had been going on simultaneously with the getting out of gold, there was not sufficient information given as to what should be charged to revenue and what to capital. The accounts were based upon the idea that there was a profit of 35*s*. per ounce on the gold got out. There was no doubt the accounts were sent home in a very deficient and unsatisfactory state.

The Chairman said the directors were pleased that this question had been brought up, because they had felt several times during the year that the company was not properly served by the agents in Sydney. It must be remembered that the present agents were decided on long before the present board took office—in fact, the agents had held office from the time the company was formed; but, at the same time, he could quite bear out everything that Mr. Jackson had said relative to the unsatisfactory way in which the accounts were sent from Sydney. He said this because he knew it would reach the ears of Messrs. Weston and Co., and he should be very pleased if it did. The company did not seem to be very well served by that firm; they did very well last year, but this year they had not done at all well, and, therefore, Mr. Jackson is in the unpleasant position of having to present accounts which contained only limited information. He should be glad to hear a suggestion from any shareholder as to what should be done in the matter. The directors had no wish to incur any expense in Sydney beyond what was absolutely necessary, and if the company could be served there at half the cost, or at less cost, with equal efficiency, he should be only too glad to make any arrangement which the shareholders wished in the matter.

The Rev. Mr. Greenwood said he believed Mr. Joseph went out there to put everything right which was wrong, and one would suppose that this was one point to which Mr. Joseph would direct attention. He would ask whether the directors had received any letters from Mr. Joseph?—The Chairman said that letters had been received, but Mr. Joseph had not mentioned Messrs. Weston and Co. In a few weeks the directors expected to receive Mr. Josephs' full report upon the state of the mine, and he supposed that report would also include the question of Messrs. Weston and Co. As regarded the 100*l*. to be paid to Mr. Joseph, it must be borne in mind that that was expressly set aside by the shareholders themselves for that purpose. When the report of Mr. Joseph was received it would be the duty of the directors to do something decisive with regard to Messrs. Weston and Co. He might also mention that the directors had requested Mr. Jackson to draw up a letter, which would be sent to Messrs. Weston and Co., complaining pretty strongly of the way in which the accounts had been sent home.

A Shareholder: I suppose it is absolutely necessary to have someone on the spot to receive the gold?—The Chairman said it was the practice adopted on all the mines.—Mr Hickey thought the work should be done by a mercantile firm. There was nothing to do but simply to copy the letters from the mine, and send them on to the board.—The Chairman said the matter would have the full attention of the board, and if a new agent were appointed the directors would take care to receive good recommendations with him.

Mr. Hickey went on to say that the report scarcely contained sufficient details, and moved that the meeting be adjourned for six months, until further information was received from Sydney, and then the present report could be amended by printing in it extracts from the reports received from the colony.

The Chairman pointed out that in a directors' report it was almost impossible to give extracts from colonial reports, or rather it would be possible to give them, but unless the extracts were read with the context of the letters it was almost impossible to form a proper judgment as to the bearing and meaning of such extracts. All the telegrams which had been received had been regularly sent to the daily papers, but the number of telegrams was not quite so large now as formerly, as the directors were desirous of keeping down the expenses in every possible way, and telegrams were very expensive things. Any shareholder could come to the office and read all the telegrams and letters.

Mr. Saffell said he was a new shareholder, but he certainly thought some further information should be given, and, therefore, he would second the motion for the adjournment of the meeting for six weeks.

A short discussion ensued, and some of the shareholders asked what good would result from the adjournment?—The Chairman said that as a matter of fact no report would be received from the mines for another two months; however, as Mr. Hickey seemed to wish to have the amendment put, he would put it.

The amendment was then put and lost. The original resolution was then put and carried.

The Chairman said that with respect to the meeting being held on Saturday, they were bound to have the meeting before Oct. 15, and it had been postponed until the latest possible date, in the hope that a telegram would be received announcing that the connection between the middle winze shaft and the main adit level had been completed.

The next business was the re-election of the retiring directors, and the Chairman moved that Mr. John Rodgett be re-elected.—Mr. Smythe seconded the resolution, which was put and carried.

The Chairman then moved that Mr. S. A. Joseph be re-elected, which was seconded by the Rev. Mr. Greenwood.

Mr. Hickey proposed that Mr. McLagan, M.P., be elected a director in the room of Mr. Joseph.—The Chairman said that no one could be more fitted for the post than Mr. McLagan, but, as a matter of fact, Mr. Hickey had not given the necessary ten days' notice of his intention to propose that gentleman, and, therefore, the amendment could not be put.—Two or three of the shareholders expressed an opinion that, even independent of that, it was scarcely fair to turn out Mr. Joseph without any particular reason being assigned, and whilst he was in the colony on the service of the company.—The resolution for the re-election of Mr. Joseph was then put and carried.

The auditors, Messrs. Jackson and Hull, were re-appointed.

A vote of thanks was then passed to the Chairman and directors, and the meeting broke up.

WEST FRANCES MINING COMPANY.

A three-monthly meeting of adventurers was held on Thursday at the mine—Mr. Walter Pike, the purser, presiding.

The labour costs for the three months were stated to be 2158*l*. 13*s*. 5*d*.; merchants' bills, 938*l*. 12*s*. 5*d*.; rates, 33*l*. 17*s*. 5*d*.; and bankers charges, 64*l*. 10*s*.—total, 3195*l*. 13*s*. 3*d*. The credits were for 67 tons of tin 2745*l*. 19*s*., and for copper 4*l*. 18*s*. 4*d*., showing a loss on the three months' working of 444*l*. 15*s*. 11*d*., and a balance against the mine of 2468*l*. 2*s*. 10*d*.

The agents' report stated that Bailey's engine-shaft was sunk to the 154. They had been cutting into the lode, which was principally standing to the north of the shaft, and it produced tin-stuff of low quality, but more lode was still standing. To the east of the shaft the 144 was driven through a productive lode for several fathoms in length, so that they might reasonably expect an improvement in the 154 on being driven further east. The 144, east of cross-course, was producing a little tin, but there was a long piece of unexplored ground in this direction between this end and West Basset which ought to be proved. Smith's shaft, which was being sunk below the 140 fm. level, was worth for 12 ft. long 20*l*. per fathom. In the 132 cross cut north they had not yet intersected anything beyond a few branches, but they strongly recommended a continuance of this cross-cut, as the West Basset engine lode could not be far distant, and in that mine it produced a large quantity of copper. The great flat lode might also be intersected at any time. In the 40, west of Bailey's shaft, the lode has recently much improved, and is now worth 12*l*. per fathom, the ground being easy for working. There are nearly 100 fathoms of unexplored ground before this end, to the western boundary of the sett.—South Lode: Fortescue's shaft is being sunk below the 80, and they are also rising above the 100 towards this, and expect to hole this shaft in about a fortnight, when a piece of ground will be laid open for working for 20 fathoms in height. The lode in the shaft is worth 8*l*. per fathom. The 80, west of Fortescue's shaft, is driven to the cross-course, and has passed through a lode 8 fathoms in length, worth 12*l*. per fathom. A winze has been sunk from the 70 to the 80, and this ground set to stope. The 70, west of Fortescue's shaft, is also driven to the cross-course, and the lode is now continuing to the west of the cross-course, which the agents look upon as important, as they have never before found this lode to the west of the cross-course.

An excellent report was also read from Capt. Hodge, of Wheal Grenville, who had inspected the mine on behalf of Mr. Carter, of Camborne, and who expressed himself very confident that the West Basset flat lode was before them.

Capt. Thomas (the manager), in reply to a question from Mr. W. H. Rule, said he believed that in hard or wet ground dynamite was the best explosive that could be used. Tonite cost the same money, but it was not so strong.

Mr. Rule: Do you think tonite is more dangerous to use than dynamite?

Capt. Thomas: With proper care I do not think either one is dangerous, but no explosive will stand the rough treatment to which tonite was subjected at West Basset a short time since.

The Purser, calling attention to the debit balance, said the amount was heavy, but at the same time he hoped they would be able to weather the storm without making a call. (Hear, hear.) But unless tin improved he must candidly tell them that a call would have to be made. They only wanted an increase of 5*l*. a ton to enable them to pay costs. (Hear, hear.)

The deficit was then carried to the debit of the next account, and the meeting separated.

COOK'S KITCHEN MINING COMPANY.

A three-monthly meeting of adventurers was held on Thursday—Mr. W. Pike, the purser, presiding. The statement of accounts showed that the labour costs for the three months amounted to 2050*l*. 15*s*. 4*d*.; the merchants' bills to 980*l*. 5*s*. 11*d*.; rates, 44*l*. 9*s*.; and bankers' charges, 76*l*. 9*s*. 2*d*.—making a total of 3151*l*. 19*s*. 5*d*. The credits were 2227*l*. 15*s*. 9*d*. for 52 tons of tin, and 38*l*. for repairs of water-course, leaving a loss of 886*l*. 3*s*. 8*d*. At the last meeting the debit balance was 1956*l*. 0*s*. 9*d*.; but a call of 7*s*. 6*d*. per share was then made, realising 880*l*. 10*s*. 6*d*., and the balance now against the adventurers was 1961*l*. 13*s*. 11*d*.

The Purser said it would be seen from the accounts that the loss was about the same as that incurred in the previous three months, while the price of tin—the average of which had been about 44*l*. a ton—was lower than he had ever remembered since he had been connected with the mine. He did not like to indulge in prognostications as to the price of tin, but judging from what he could hear from good authorities, it really seemed as if the turn had come at last. This week there had been a rise of 2*l*. in the standard, and he had no doubt that there would have been a further rise, but for the disastrous news which had just come from the East; at the same time, recent statistics showed that the London stocks did not amount to more than six months' supply, and a very little demand would soon absorb the greater part of that. There was every reason to hope that in the coming three months they would have a higher standard than they had at present, and he had also reason to hope that their returns of tin would be increased; for an increase in price meant an increase in quantity, because there was a large amount of tributers' tin ground in the mine which would not pay at the present price, whereas a small rise would soon bring the tributers back.

Capt. Josiah Thomas then read the agent's report, which said:—In the 320, east of engine shaft, the part on which we are driving is producing good stones of tin, and has a promising appearance for early improvement. More lode is standing both north and south of the level, and above; the north part was the most valuable. This we shall prove in the 320 after driving a little further east. The 306, east of engine shaft, is worth 20*l*. per fathom. The 320 cross-cut is driven south upwards of 8 fms., but Dunkin's lode is not yet intersected. Judging from the underlie of that lode, as seen in the upper levels, and the appearance of the cross-cut, we think we are approaching it, and shall probably intersect it shortly. The 310, east of the western cross-cut, on Dunkin's lode, is worth 12*l*. per fathom, and judging from the length of the tin ground driven through in the 190, we are likely to have a productive lode in this level for a considerable distance. The 190, east of cross-cut is producing a little tin; about 30 fms. before this end some very good tin ground has been worked by tributers 10 fms. above the 222, so that we may fairly anticipate an improvement in driving the 190 further east. The 160, east of man-engine shaft, is worth 14*l*. per fatham. Since the last meeting we have cleared some of the old levels to the east of the man engine shaft, on Dunkin's lode, which have not been worked for upwards of 40 years. There is a large quantity of unexplored ground in this lode from the 103 downward, which we think, from what we can see of the parts already cleared, will be likely to produce a considerable quantity of tinstuff of moderate value. We are now stoping down the end of the man-engine shaft from the 140 to the 160, in order to discharge the stuff that may be broken by putting it out through the 160 cross-cut to Chapple's shaft.

There was not, Captain Thomas said, any particularly rich point in the mine, but they were opening up a large quantity of moderate quality tin ground which, with a good price for tin, would pay very well. They were obliged to leave idle a good deal of low quality ground until the price was increased. The eastern ground at Dunkin's lode fifty or sixty years ago was worked for copper, but it must have been neglected for tin. They had never seen the old levels, and did not know what they were until lately; but they had now opened out some moderately productive ground, and he thought they would have a large quantity of that kind of ground.

Capt. Thomas, in reply to Capt. Bailey, said he did not think they could judiciously reduce their cost below its present amount. They could stop the tutwork ends, but if they did that they would not be opening up any new ground, or developing any new points; nor could they stop the 320 east, for there they were almost sure to have a good lode. They would not make so great a loss next time, even with tin at its present price. (Hear, hear.)

A call of 7*s*. 6*d*. per share was made, and the meeting separated.

NEW COOK'S KITCHEN MINING COMPANY.

The adventurers in New Cook's Kitchen held their meeting immediately afterwards,—Mr. W. Pike (the purser) in the chair.

The accounts showed that the balance against the mine at the last meeting was 799*l*. 12*s*. 2*d*.; the labour costs down to Sept. 23 were 407*l*. 1*s*. 8*l*.: merchants' bills, 388*l*. 3*s*. 8*l*.; engineers' fees, 33*l*. 12*s*.; discount on calls, 32*l*. 11*s*. 6*d*.; bankers' charges, 19*l*. 13*s*.; calls on forfeited shares, 79*l*. 5*s*.: total, 1759*l*. 19*s*. A call of 10*s*. per share was made at the last meeting, and the balance now against the mine was 716*l*.

The agent's report was read, as follows:—

The engine-shaft has been cut down from the surface to the 80, to which point the mine was dry. The shaft has been also cased and divided, and the necessary pitwork fixed. The pumping engine was set to work on Friday last, and the water is now being drained below the 80. We have now to drain the mine to the 125, which we shall do as quickly as possible. There is said to be a good lode of copper at the 125, and some tin and copper ground at the 100, so that we think it not unlikely we shall be able to raise some copper and tin before the next account. We have an excellent pumping engine and steam whim, and all the machinery and pitwork are in first-rate order. The cost of working the mine will be comparatively small, and taking into consideration the size of the lode and its productiveness where it has been worked in the mines to the east we think the prospects of success are exceedingly good. The great cross-course near to which all the lodes for some distance north and south have been very productive lies in the western part of the sett, and no level has been driven near it. The 80 west is some 60 fms. short of it, and we propose at once to drive this level west to explore this ground, and as soon as the bottom of the mine is reached to drive also at the 125, and to sink the shaft below that level towards the junction of the killas and granite, which is probably not far distant, and where the same lode to the east has produced large quantities of copper and tin.

Capt. Thomas added that if New Cook's Kitchen did not turn out a success he did not known where to look for a successful mine. It was in the heart of rich copper mines, and every lode both to the north and south had been rich without exception.

The accounts having been passed, the Purser said they had been engaged in negociating for the placing of the remaining forfeited and relinquished shares, which still amounted to about 500, but he thought he might say that those shares might now be considered as all placed. He had not credited that amount, because it was only that morning he had received an answer from some of the parties to whom application had been made. But in making provision for the debit balance they might fairly assume that within the next week they would have the money. This would reduce the balance to 451*l*. 9*s*. Since the last meeting, six months ago, the committee who were then appointed to dispose of those shares had met, and as mining was in such a low state they decided to issue them at such a price as would ensure their being taken up. They, therefore, fixed the price at 10*s*. per share, and they would now return to the original number of 2450.

A call of 4*s*. per share was then made; and, on the motion of Mr. Carter, seconded by Mr. Rule, a vote of thanks was given to the committee for the trouble they had taken in placing the shares.

The Purser, in acknowledging the vote, remarked that to place the quarter part of a mine in times like the present was something to be proud of. (Hear, hear.) They had had a large number of shares thrown on their hands, and at one time it certainly was a question of life or death, but he was glad to say that danger was now past, and that the mine was fairly started. He believed the next three months would place them in such a position as to make those who had taken the shares very glad indeed that they had done so. (Applause.)

This concluded the business of the meeting.

FOREIGN MINING AND METALLURGY.

The improvement noticed in the French iron trade continues, but it is not considered to have become more decided. The markets still exhibit a certain indecision. The large establishments, nevertheless, have work; Creusot, Terrenoire, Châtillon, Commentry, Denain, and Firminy have all rails to make. Fives-Lille and Creusot are also working for the Exhibition of 1878, and a revival established upon such bases appears likely to be serious, or at any rate more serious than it is supposed to be at present. Prices remain without variation. First-class merchants' iron is quoted at about 7*l*. 4*s*. per ton; in the Nord it may be obtained upon slightly cheaper terms. The state of the German iron trade is reported to be still indifferent; cast-steel rails, delivered in 1877, have been offered at 7*l*. 5*s*. 6*d*. to 7*l*. 8*s*. per ton.

Industrials in Belgium appear to be generally pretty well satisfied with the course which the iron trade is taking in that country, but rather with reference to the importance of the orders obtained than to the lucrativeness of the prices realised. Foreign competition, and the competition which the principal Belgian establishments carry on with each other, are the causes which keep quotations at their present low level. Although steel is making more and more progress day by day, in consequence of its durability and its comparatively low price, a rather important Belgian firm has just concluded a contract for 200 tons of iron rails, with bolts and cramps; these rails are to be forwarded to Java, and their price is 7*l*. per ton on board at Rotterdam. The order for railway *matériel* for a line in Venezuela just secured by a syndicate formed at Liège for the establishment of commercial relations with South America, will afford employment to some dozen Belgian firms; the order comprizes steel rails, locomotives, passenger carriages, goods trucks, &c. The Belgian engineers will be charged with the construction of the railway which will unite the port of Guayra to Caracas. The line is to be a single one; its length will be 25 miles. It is proposed to experimentally lay down iron sleepers on 31½ miles of the Belgian State railways. An adjudication of Bessemer steel tyres for lines in Alsace and Loraine has been just announced.

The deliveries of coal have been more sustained in almost all the Belgian basins. For the moment most of the Belgian collieries have enough to do in order to satisfy the requirements of pressing clients, who have waited till the last moment before doing business. The Belgian sugar works are in full activity, and they are absorbing a rather considerable number of trucks; this circumstance causes the insufficiency of rolling stock on the Belgian State lines to be felt more pressingly than ever. The demand for industrial qualities of coal has received a slight impetus during the last few days; the Belgian construction workshops have secured some additional orders, and this circumstance has exercised a direct influence on the coal markets. The improvement of working appliances has been everywhere receiving much attention, and efforts are also being made to secure economy of combustible as regards extraction and ventilating engines. Among the new "installations" which appear especially worthy of notice may be mentioned those of the St. Henriette pit, at Mariemont, and the new pit of the Sacré-Madame Colliery, near Charleroi.

An improvement is noticed in the French coal trade, and it appears to be general. In the Nord and the Pas-de-Calais the extraction has become more regular, and winter supplies have been laid in with activity; prices have been also firm. In the basin of the Loir, large rail orders received from the Paris, Lyons, and Mediterranean Railway Company are expected to have the effect of increasing the demand for combustible on the part of the local ironworks. Notwithstanding, however, the increased activity in the demand, and notwithstanding the reduction which has been taking place in stocks, prices remain without change, although they have been supported with firmness. The Paris coal market has ruled quiet, and

it is expected to remain so until the cold weather. Paris is a market which reflects very sensitively variations of temperature. MM. Dehaynin and Co. have concluded a contract for the annual delivery of 72,000 tons of briquettes for a period of five years to the Eastern of France Railway Company.

COMPRESSING AIR, AND OBTAINING MOTIVE-POWER.

Although probably too much is claimed for the invention of Mr. EMILE HEYLER, of Paris, a circumstance which may account for the abandonment of the application for a patent in this country, there may be something in his propositions worthy the attention of those who may be interested in the compression of air. The object of the invention is to obtain compressed air without other resistance than that of friction, that is to say, with a slight expenditure of force that the whole of the air thus compressed may be utilised for working an engine of any kind, which engine will also itself compress the air required for working it without any appreciable loss of power during the whole time it is in operation. It is claimed that by means of this invention neither fuel, water, heat, gas, or electrical apparatus are required for working stationary or portable engines. Suppose that the air contained in the greater of two cylinders having the same height, but the one being of ten times greater capacity than the other, be transferred to the smaller of the cylinders, this air will have a pressure of 10 atmospheres. But in order to thus transfer the air from the larger to the smaller cylinder, a considerable amount of force is required, equivalent to 1 kilo. 033 per unit of surface or square centimetre multiplied by the number of atmospheres obtained. Both cylinders are open to the external atmosphere.

To neutralise this resistance Mr. Heyler considers it necessary to oppose an equivalent force in the shape of a piston. He employs a cylinder about 20 centimetres in length, open at top, and in which works a piston. The cylinder is divided by measurements into ten equal parts. Alongside the cylinder is a tube whose sectional area is one-tenth that of the cylinder. This tube is open at the top, and is also divided by measurement into ten equal parts, each equalling the ten divisions of the cylinder, and the tube is also provided with a piston, and it is placed in communication with the bottom of the cylinder. For each division the cylinder piston is moved downwards, the tube piston is raised one division in the tube, and if we suppose the tube piston to equal the unit of surface, that is to say, 1 square centimetre, the weight of the column of air raised in the tube will be 10 × 1·033 or 10·33 kilos. = 10 atmospheres. The pressure on this square centimetre will thus balance the pressure necessary to bring the piston to the bottom of the cylinder. If the two pistons be connected to two cranks placed in the same plane, but on opposite sides of a shaft, or on two shafts connected by toothed gearing, it will be evident that the pressures being the same on both pistons they will balance each other in any position which may be assigned to them. The fly-wheel will always furnish sufficient power to overcome the friction against the sides of the cylinders, and the apparatus may in this manner be charged by hand without much expenditure of force up to a pressure of from 50 to 60 atmospheres.

METALLURGICAL FURNACES.

It is well known that in the ordinary process of combustion oxygen and carbon can be made to combine in two definite proportions, forming carbonic oxide, or carbonic acid, carbonic oxide being formed when carbon is burned in a limited supply of oxygen, carbonic acid being the result of the perfect combustion of carbon, carbonic oxide containing one atom of carbon and one atom of oxygen, carbonic acid being composed of one atom of carbon and two atoms of oxogen. When 1 lb. of carbon is combined in the process of combustion, with 1⅓ lb. of oxygen, the total amount of heat developed is 4400 British thermal units, the product being 2⅓ lbs. of carbonic oxide, which can be combined by combustion with 1⅓ lb. of oxygen, and by so doing develope heat amounting to 10,100 thermal units. When 1 lb. of carbon is combined in the same manner with 2⅔ lbs. of oxygen the amount of heat developed is 14,500 thermal units, and the product of combustion is 3⅔ lbs. of carbonic acid.

The burning of carbon as it takes place in the combustion chambers of ordinary furnaces is always complete at first, provided the layer of coal from which the carbon is obtained is not so thick and the supply of air so small, but that oxygen in sufficient quantity can get direct access to all the solid carbon—that is to say, 1 lb. of carbon combines with 2⅔ lbs. of oxygen, and makes, as stated above, 3⅔ lbs. of carbonic acid, and thus carbon, which is solid immediately before the combustion, passes during the combustion into the gaseous state, forming with the oxygen carbonic acid gas, and producing 14,500 thermal units per pound of carbon consumed, and under these conditions the process terminates; but when part of the solid carbon in the furnace is not supplied directly with oxygen, being first heated and then dissolved into the gaseous state by the hot carbonic acid gas, which has already been formed in it, the product is carbonic oxide gas, 3⅓ lbs. of carbonic acid gas being capable of dissolving 1lb. of carbon, and thus making 4⅔ lbs. of carbonic oxide gas. The volatilising of this second pound of carbon causes a loss of heat amounting to 5700 thermal units, which, being taken from the 14,500 thermal units produced by the perfect combustion of 1 lb. of carbon, there remains 8800 thermal units. Should the process stop here the waste of fuel is very great, but if the 4⅔ lbs. of carbonic oxide gas is mixed with a sufficient quantity of fresh air of proper temperature, it will burn with a blue flame, and the product will be 7⅓ lbs. of carbonic acid gas, the amount of heat heat developed in the process amounting to 20,200 thermal units. Adding to this the 8800 thermal to its above, we have 29,000 thermal units as the result of the perfect combustion of 2 lbs. of carbon.

In its action upon metals and metallic oxides it is well known to metallurgists that carbonic oxide is a reducing gas, and that metals are not readily oxidised, even when exposed to it at a high temperature. It is also known that when metals which have an affinity for oxygen are exposed to the action of carbonic acid gas at a high temperature, they are rapidly oxidised, and thus burned up and wasted. In the furnaces in common use for manufacturing wrought-iron the atmosphere of the heating chamber is usually kept in such a state as to prevent the oxidation of the iron while it is being heated; this is accomplished by supplying the combustion chamber of the furnace with a large amount of carbon, which of necessity must be burnt in a limited supply of air, which results in a large waste of fuel. Now, the objects of the invention of Mr. ELLIOT SAVAGE, of West Meriden, New Haven, U.S., are—first, to prevent the oxidation of the metal in the smelting chamber when brought to a high temperature by supplying said chamber with the reducing gases at the requisite degree of heat to smelt the metal without producing complete combustion in the chamber; and, secondly, to prevent the waste of fuel by supplying the reducing gases after leaving the smelting chamber with a fresh supply of oxygen to produce complete combustion, and utilise the heat thus produced to heat the reducing gases to the proper temperature before entering the smelting chamber.

The method by which Mr. Savage proposes to prevent this waste will be readily understood from a description of his improved furnace. The parts of the furnace consist of a first combustion chamber, or fire-box and ash-pit, and an uptake shaft, a flue by which the air is conducted to the ash-pit, a flue for conducting air to a second combustion chamber, a flue in which the reducing gases are heated on their passage through to a smelting chamber. The coal is fed from a box with inclined plane, down which the fuel passes into a coking chamber. There is a flue to convey the gases from the smelting chamber to the second combustion chamber, which surrounds the flue carrying the reducing gases, and in which flue gaining a fresh supply of oxygen they are completely consumed. Fire being kindled in the first consumption chamber, the box being filled with coal, air is forced in by the ash-pit flue up through the fire-bars of the fire-box. Complete combustion is produced immediately above the grate bars. The result of this complete combustion passing up through the incandescent fuel receives from the fuel being coked on dead plate of coking chamber another portion of carbon forming carbonic oxide. This reducing gas passing through flue into smelting chamber, and there into the second combustion chamber, receiving a fresh supply of oxygen, as stated previously, the perfect combustion of the fuel is accomplished. The heat thus generated is communicated to the walls of the second combustion chamber and the flue, the gases then passing out to the uptake. When a sufficiently high temperature has been attained for the purpose desired, the combustion can be retarded by regulating the supply of air through the air passages conducting air to the ash-pit or to the second combustion chamber; thus a great saving of fuel is accomplished, and a strictly reducing gas introduced into and maintained in the smelting chamber, while the oxidising flame is confined entirely to the second combustion chamber.

SEAMLESS METALLIC TUBES.

Some improvements especially applicable to the casting of hollow ingots of copper for the manufacture of seamless tubes have recently been patented by Mr. WILLIAM WEBB, of Smethwick. The cylindrical mould is supported by a horizontal axis, which works in bearings in a fixed support. The said axis is above the centre of gravity of the mould, and the said mould consequently takes a vertical position when free to move, and is fixed in this position during the casting process. It can, however, be turned upon its axis into a horizontal position. The central core is supported in the mould at bottom on the closed bottom of the mould, and at top by means of a bracket carried by the mould. At the top of the mould a shoulder is formed by turning away a portion of the metal, and upon this shoulder a funnel-shaped receptacle is fitted, the said receptacle opening into the top of the mould, and being capable of turning freely upon the shoulder on the top of the mould. On the outside of the said funnel-shaped receptacle, and by preference near its base, is a bevil toothed wheel, which gears with another bevil wheel on the end of a horizontal axis which is furnished at its other end with a winch. By turning the said winch the said funnel-shaped receptacle can be made to rotate.

In using this apparatus the mould is fixed in its vertical position, and the two bevil wheels are geared together. By turning the winch the funnel-shaped receptacle is made to rotate. The molten metal is poured into the said receptacle, from which it passes into the mould. By the rotatory motion of the receptacle a rotatory motion is given to the molten metal, which falls into the mould in that state of motion. The resulting casting is free, or nearly free, from the spongy or porous character which all castings have more or less when the metal is poured directly from the melting pot or crucible and allowed to fall with only a vertical motion into the mould. After the casting has cooled the mould is brought into a horizontal position, and the hollow ingot is withdrawn from it.

NEW METALLIC ALLOY.

By the combination of bronze with spiegeleisen or ferro-manganese, Mr. P. M. PARSONS, of Blackheath, has succeeded in producing an alloy which is claimed to be more homogeneous and closer in texture, harder, and stronger than most of the alloys of which copper forms the base. In carrying out his invention he finds that to obtain the best effects it is desirable that the ferro-manganese to be used with gun-metal alloys (he designates as gun metal alloys those composed of copper and tin; as bronze, those composed of copper, and tin, and zinc) should be richer in manganese than that used with the brass alloys, while that used with the bronze alloys may be between the two, and regulated as conveniently as can be by the proportions of tin and zinc employed—that is to say, if little zinc is used in the bronze alloy the ferro-manganese employed may be as rich or, nearly as rich, in manganese as in the gun-metal alloys, while if the zinc predominates the ferro-manganese employed may be the same as or a trifle richer in manganese than that used with the brass alloys; and if the zinc and the tin are about equal the quantity of the manganese contained in the ferro-manganese may be between that used for the gun-metal and that used for brass alloys. The ferro-manganese used to mix with the gun-metal alloys should contain from about 10 to 40 per cent. of matallic manganese, while that used to mix with the brass alloys should contain from about 5 to 20 per cent. of metallic manganese, and that used for the bronze alloys should be between the two, according to the proportions of tin and zinc employed.

In selecting the ferro-manganese it is very desirable that it should contain as little silicon as possible; when spiegelesen can be obtained of the best quality, containing but a minute quantity of silicon and from 5 to 10 per cent. of manganese, it will be suitable to mix with the brass alloys, and it may even be used with the gun-metal alloys; but it will be found advantageous to employ for both as well as for the bronze alloys a ferro-manganese thus manufactured. He obtains ferro-manganese as now manufactured for and used in steelworks rich in metallic manganese, containing (say) from 50 to 60 or even 70 per cent., this he melts in a crucible under powdered charcoal along with the requisite proportion of the purest wrought-iron scrap he can obtain to bring down the quantity of metallic manganese to any of the proportions before named; he thus obtains a ferro-manganese containing the least possible quantity of silicon. Thus, supposing it is desired to employ a ferro-manganese to mix with any of the before-named alloys containing 20 per cent. of manganese and a ferro-manganese containing 60 per cent. of metallic manganese and (say) 1 per cent. of silicon is melted with wrought-iron scrap in the proportion of 100 of ferro-manganese to 200 of wrought-iron scrap, a ferro-manganese containing the desired quantity of metallic manganese—20 per cent.—will be obtained containing only one-third per cent. of silicon instead of 1 per cent., and so on for any other proportions required; not only this, but a still further portion of the silicon is eliminated and the metal refined by this second melting in a crucible.

The quantity of ferro-manganese to be employed will vary both with the nature of the alloy as well as with the quality required in each particular alloy, and this will also to a certain extent have to be regulated by the quality of the copper, tin, and zinc employed; the purer these metals, the larger may be the quantity of ferro-manganese employed, and, therefore, no precise quantities can be specified; but generally for ordinary gun-metal—that is to say, gun-metal composed of about 90 per cent. of copper and 10 per cent. of tin—from ½ to 1½ per cent. of ferro-manganese, as above described, may be added, containing (say) about 20 per cent. of metallic manganese, and as the tin is increased the ferro-manganese should contain more manganese and less iron. The quantity of ferro-manganese employed should be regulated according to the purposes for which the alloy is intended to be used; generally the effect produced is with the smaller quantities named to increase the strength of the alloy and the hardness slightly, and as the quantity of ferro-manganese is increased the hardness is also increased, but at the same time the alloys becomes more brittle. A similar effect is produced by the addition of the ferro-manganese to the brass and bronze alloys. With the brass alloys from ½ to 5 per cent. of the ferro-manganese, as above described, may be employed with advantage for general purposes, and for the bronze alloys any proportions between those to be used for the gun-metal and brass alloys may be advantageously used, these proportions being adjusted according to the quantities of tin and zinc used—that is to say, the more tin used the less should be the quantity of ferro-manganese.

In carrying out the invention, the copper should be first melted in a crucible or other vessel in the ordinary manner, and the spiegeleisen or ferro-manganese, either with or without the addition of wrought-iron scrap as before described, should at the same time be melted in a separate smaller furnace capable of generating a high temperature in a plumbago crucible under powdered charcoal, and when it is completely fused, and the copper is also fused, and at a boiling heat, the ferro-manganese should be poured into the copper and the two well mixed together by stirring with an iron rod previously made red-hot; the tin, or zinc, or both, should then be added in the usual way and in the requisite proportions, according to the kind of alloy it is desired to produce. After the tin and zinc are added the metal should be again well stirred with a red-hot rod and skimmed; it may then be either poured into ingot moulds for future use or it can at once be cast in moulds to produce any articles required. In making castings he finds that dry sand or loam moulds well coated with charcoal blacking are preferable to green sand moulds; the metal should be well skimmed before pouring, and it should be cast at as low a heat as possible, so long as it is sufficiently fluid to fill the mould, and the runner should have a good head and be attached to the thickest part of the casting, which, if possible, it should exceed in bulk, so as to solidify the last and act as a feeder while the cast is cooling. If metal moulds are employed the alloy is rendered closer in texture and somewhat harder.

NEW PROCESS OF TREATING ORES.

THE MONNIER SYSTEM.

This process which was originally introduced for the treatment of copper ores, but has since been successfully applied to the ores of other metals, is now being largely used in Nevada county, California, U.S. The ore is mixed with sulphate of soda and crushed fine enough to pass through a No. 24 screen. It is next roasted in a muffle furnace or a revolving cylinder furnace; the sulphur will begin to burn within an hour after the introduction of the ore, and after that time but little fuel is needed until toward the end of the roasting. Sulphuric acid is formed by the oxidation of part of the sulphur, while the larger proportion of the sulphur escapes as sulphurous acid. The iron, copper, and silver are converted by the sulphuric acid into sulphates, and the sulphate of soda into a bi-sulphate. Soon all the sulphur not combined with the soda or metallic oxides is expelled. A low red heat is now reached, and the sulphates of iron and copper suffer decomposition. The sulphuric acid at first combined in this form has been stored up, and is now evolved by the greater heat. Being nascent, its combining power is of intense activity and force, and it attacks any and all metallic oxides or sulphides remaining uncombined, converting them with great rapidity into sulphates. The copper and silver present are soon converted into soluble sulphates, iron oxide and gold remaining unconverted and insoluble. In this latter stage of the roasting the value of the sulphate of soda becomes apparent; it holds fast to the excess of sulphuric acid formed during the early stage, and carries it on to this critical point. While by other methods of roasting to sulphates, only a portion of the metals are retained as sulphates and the balance is reduced to an insoluble form, by this method the acid is retained until required by the copper and silver, when it is given up at the right time, and those metals are recovered with great ease. If the saving of the sulphuric acid evolved should be of consequence, the gases from the furnace may be led into the usual lead chambers.

The roasted ore is next placed in tanks and lixiviated with cold water. The use of hot water is to be avoided, as it would dissolve a greater quantity of base metal sulphates, notably those of lead and antimony. The leaching water, highly charged with copper, silver, and soda sulphates, is conducted into tanks containing cement copper, on which the silver is precipitated in a metallic form as cement silver, whence it may be recovered by the usual methods. The large amount of sulphate of soda present in the liquor must now be recovered and regenerated for future operations. To effect this the solution is run into crystallising tanks, and left for several days, when most of the soda will crystallise out. The crystallisation is interrupted before the sulphate of copper begins to deposit; and the solution is run into an evaporating furnace. In this the hearth is a wooden box lined with lead, and it is divided with a descending flue. This is only moderately heated. It receives a steady supply of liquor to maintain a constant level. In this furnace the sulphates of soda and copper as they crystallise are raked out, while the final charge is evaporated to dryness. Some 60 per cent. of the sulphate of soda originally present is obtained from the first crystallisation, which, as soon as it is drained and dried, is ready to go the round again. The 40 per cent. balance is not lost, but is recovered in a subsequent operation. The dry sulphates of copper and soda are next mixed with charcoal and heated in a reverberatory furnace. As soon as fluidity is attained, sulphurous acid is evolved. The mixture is gradually heated to redness, at which temperature it is kept until all the sulphurous acid is expelled. The sulphate of soda remains undecomposed, and the sulphate of copper is converted into mixture of red oxide and metallic copper. The calcined mixture, when cold, is washed in a tank of water, where the unburned coal and soda are easily separated. The soda being again in solution may be run into a crystalliser and completely recovered. The copper is now ready for the refining furnace, which refining does not differ from the ordinary process.

The plant of the Monnier process costs but little. For complex copper ores probably no establishment could be built on any other plan with a less amount of capital. About a week is required for the passage of the ore and products through the various operations. It is estimated that ingot copper can be produced in a works of this nature from a 10 per cent. ore for 5 cents per lb.; which is considerably cheaper than by the English or German plans of fusion. Very little skilled labour is required. The use of metallic iron for the precipitation of the copper is avoided by the use of sulphate of soda and the method of reducing the sulphate of copper. The soda is used continually with but little loss. Wear and tear are very small, as only low heats are required. The process enables all the valuable metals in the ore to be extracted, while the sulphur can be converted into sulphuric acid. The concentration of poor ores is not so obligatory as in the fusion processes and poorer ores can be worked. During the roasting it is probable that a double salt of soda and copper is formed, which helps to keep the copper in a soluble form. The washed copper has almost the exact appearance and richness of cement copper precipitated by metallic iron, and undergoes the same species of refining. The actual consumption of soda does not exceed 1 per cent. for each operation. The loss of copper is not more than 5 per cent., and may be even less with good management.

IMPROVED LUBRICANT.—In making his lubricant, which he describes as particularly applicable to colliery wagons, Mr. GEORGE NEWTON, of Bow, takes lime, which is first slaked, and then to this is added oil, preferably tar oil, and both are thoroughly mixed together, and then the water and impurities are drawn off in form of liquid. To this compound he then adds in suitable proportions of resin oil, which is thoroughly mixed therein. The above when thoroughly mixed forms a lubricant which is useful for slow moving machinery, such as colliery wagons, but where friction is great, as in fast moving machinery or carriages or wagons, then to the above he adds any suitable soda, for instance, caustic soda in solution; and he sometimes in the case of this latter form of lubricant dispenses with the lime; or he sometimes makes the lubricant of lime, resin oil, and pitch, which latter has been previously dissolved with tar oil; or he can use the whole of the above-named ingredients combined in suitable proportions in making another form of lubricant. For some purposes in making the lubricant, the lime, oils, and pitch are boiled.

MANUFACTURE OF SULPHURIC ACID.—In the production of sulphuric acid Mr. C. E. ARMENGAUD, sen., of Paris, takes either certain anhydrous sulphates (such, for example, as those of iron, zinc, and alumina), which at a high temperature split up into the residual base, and a mixture of sulphurous acid and oxygen, or he takes certain anhydrous bi-sulphates (such, for example, as those of potash and soda), which at a high temperature split up into neutral sulphates and a mixture of sulphurous acid and oxygen. Either of these sulphates or bi-sulphates he strongly heats in a retort or in a muffle furnace, constructed of brickwork or other fire-resisting material, so as to effect their decomposition. He then passes the resulting volatile products and gasses over substances (such, for example, as spongy platinum or the oxides of chromium or of iron or copper), which at a moderate temperature—at about a dull red-heat or somewhat below that temperaure, possess the property of causing the sulphurous acid and oxygen to combine, so as to form anhydrous sulphuric acid. This he condenses either alone in a suitable apparatus, or he causes it to be absorbed by ordinary sulphuric acid, so as to form Nordhausen or fuming oil of vitriol. Of the anhydrous sulphates which may be employed for this purpose he prefers to ues anhydrous bi-sulphate of peroxide of iron, and of the anhydrous bi-sulphates he prefers to use anhydrous bi-sulphate of soda, because

these compounds when heated revolve a portion of their sulphuric acid as anhydrous sulphuric acid in addition to the sulphurous acid and oxygen produced by their decomposition, and require on that account less of the katalylic or re-combining substances or agents.

THE COMPLETE PRACTICAL MACHINIST.

Although there can be no substitute for practice in making a good mechanic, it is beyond question that the labour of acquiring expertness can be materially lessened by systematic instruction in the general principles upon which the work is performed, and this instruction is the more important in aiding the workman in dealing with matters which are not exactly within his every-day experience. But there has always been a difficulty with practical machinists in getting a book sufficiently scientific and systematic to be useful to him, and at the same time sufficiently popular to make it intelligible and interesting. It is to the production of a work that shall fulfil both those requirements that Mr. Rose has devoted himself in the volume just issued* under the above title. He very truly says that the education of the machinist in the science governing the daily practice of his art has not received its proper share of attention at the hands of those authors who have written books upon mechanical subjects; and that the artizan is in consequence deprived of the aid derivable from the experience of the thousands who have trodden the same path before him. Hence it takes years of practice and observation to acquire knowledge that could be gained in a comparatively short space of time by the aid of a little book learning.

Practical workmanship, as Mr. Rose very truly remarks, is not a mere matter of accustoming the fingers to perform mechanical movements, but is governed by a series of distinct principles, simple and complex, the employment of which depends at all times upon the perception and judgment of the artizan. Nearly the whole distinction between an expert and an indifferent workman consists in their relative capability to perceive the principles applicable to particular work, and in their readiness in overcoming the innumerable little obstacles which present themselves, rendering a deviation at times from a common rule either highly advantageous or absolutely necessary. The inexperienced or unobservant mechanic frequently fails to recognise the very principles he applies to his work, although conscious of a large class of conditions under which he would proceed by the same method, because experience has forced it upon him as indispensable in such cases. Being dependent upon the information which he may be able to gather from the particular pieces of work which chance to fall to his lot, and to such scraps of disjointed instruction as a fellow-workman may feel disposed to impart, it often occurs that when he encounters a difficulty the more experienced hand who helps him out of it neglects to explain the principle governing the means by which the difficulty was overcome, so that the uninitiated gains nothing by the experience, and fails to perceive the numerous applications of similar remedies to parallel obstacles. In practice much, of course, depends upon the nature and size of the work, the depth and nature of the cut, and numerous other influences, but a knowledge of the general rules, together with an intelligent understanding of the principles governing the exceptions and deviations, will enable the artizan, when a difficulty arises, to at once perceive its precise cause and to apply an adequate remedy, the conditions only requiring to be understood to render the application of the principles governing them palpably necessary, and easy of accomplishment, thus rendering the learning of a trade more a matter of understanding, and less a matter of unintelligent labour. The volume embraces chapters on lathe and machine tools, cutting speed and feed, boring tools for lathe work, screw cutting tools, general observations on lathe work, turning eccentrics, hand turning, drilling in the lathe, boring bars, laps, twist drills, tool steel, taps and dies, vise work, tools, fitting connecting rods, milling machines and milling tools, the calculation of the speed of wheels, pulleys, &c., the slide valve, how to set a slide valve, and pumps.

The illustrations are very numerous, the various kinds of tools to be used for different descriptions of work being carefully given, whilst the extreme clearness both of the engravings and letter press renders any misapprehension with regard to them absolutely impossible. The work is one which, to young machinists especially, will prove invaluable, since the attentive study of it will lighten their labour in performing the work allotted to them, and at the same time enable them to become such expert workmen as to ensure them employment, even when the services of their less intelligent companions can conveniently be dispensed with.

MYSTERIES OF NATURE, AND DISCOVERIES IN SCIENCE.

It is scarcely possible for a man devoting himself to scientific investigations, whether for pleasure or profit, to avoid noting curious facts, it may be previously unobserved, which serve to explain the cause of interesting phenomena not satisfactorily accounted for by the theories generally accepted at the time, or to remove erroneous impressions which have given rise to popular fallacies; and it is a large series of such notes as these that Dr. PHIPSON has popularised and elaborated into a very attractive volume of familiar letters† upon what one might almost designate popular Natural Wonders and popular Scientific Curiosities. He not unnaturally devotes the first letter to the consideration of the Will-o'-the-Wisp, or corpse candle, and from the way in which he deals with the matter, and the conclusions which he draws from his investigations concerning it, it is evident that his book will afford something more than mere amusement. It is a little curious that the first mention of the term *ignis fatuus* was by someone in the age of Roger Bacon at the end of the thirteenth century, or perhaps later, no evidence being found of its use by the ancients. After noticing phenomena, descriptions of which have been supposed to refer to the *ignis fatuus*, Dr. Phipson remarks that Will-o'-the-Wisp shows itself on dark autumnal nights as a flickering wandering flame hovering in the air at a little distance—2 or 3 ft. at most—from the ground or above the surface of stagnant water. It appears sometimes about the size of a man's hand, at others not larger than the flame of a common candle; it will dance wildly about for a few instants then become extinguished. At this moment another light of the same kind will show itself near the same place, and so on for a length of time. Often several of these "giddy flames" (to translate the Latin term) will be seen at once If the observer endeavour to approach them they recede; if he rushes wildly away from them the lights will sometimes follow him, dancing along in the receding stratum of air caused by his sudden retreat; and he mentions that it has been more than once recorded that in endeavouring to follow the Will-o'-the-Wisp over boggy lands some persons have been engulphed in the morass, and have lost their lives.

The records of observations of Will-o'-the-Wisps are very numerous, and it is carefully noted where they can best be seen, how to produce them artificially, and so on, mention also being made of globe lightning and allied phenomena; but, perhaps, the most startling portion of the letter is that in which Dr. Phipson connects, and upon by no means unsubstantial grounds, Will-o'-the-Wisps and colliery explosions. He shows the mere presence of marsh gas (the fire-damp of the miner), the combustion of which gives rise to the phenomenon of the *ignis fatuus*, is insufficient to produce that phenomenon, it being essential that there should also be present some phosphor compound to cause the ignition of the carburetted hydrogen, and observation has shown that this necessary phosphor compound is very freely produced by decaying animal matter. The gases evolved from the decomposition of vegetable matter alone produce no *ignis fatuus*, but where the decomposition of animal matter is going on at the same time sulphuretted hydrogen, ammonia, and phosphuretted hydrogen being also evolved, the mixed gases will take fire on reaching the surface of the water; and this accounts for the fact that in the churchyard outside the town of Gibraltar, where the corpses lie but 3 ft. below the surface in a damp sand, the splendour of the Will-o'-the-Wisps, or corpse candles, is greater than at any other place known. Drawing his conclusions from his observations, of which an attempt has been made to give an outline, he suggests that the unaccountable explosions in collieries may be due to the presence of decaying animal matter in the warm galleries of the mine. If an animal substance be decaying at the same time that carburetted hydrogen is being given off by the coal, the resulting mixture would take fire of itself as soon as it comes in contact with the air. This effect is owing to small quantities of phosphuretted hydrogen being evolved along with the other gases, and giving to the mixture the property of taking fire spontaneously. Hence, he observes what a source of danger we have in the presence of decaying animal substances in the galleries of warm coal mines. It is, perhaps, not surprising that this simple fact should have hitherto escaped the attention of all the commissions that have enquired into the causes of colliery accidents.

The letter on Electric Fogs, which comes next, is a very instructive one, the various kinds of fogs being carefully distinguished and described, and the author even going so far as to suggest a method by which the principal inconveniences connected with the dense fogs which from time to time occur in the neighbourhood of large towns, such as London, Glasgow, &c., may be removed; and the account he gives of bituminous mists is very interesting, including an abstract of Wartmann's record of the nine-nights luminous fog at Geneva in November, 1850. Dr. Phipson also remarks that for many years he has noticed at certain periods streaks or layers of white or bluish-white cloud (totally distinct from the aurora borealis) when there is no moon above the horizon; they often occur about the time of the solstices and equinoxes, and he is of opinion that this soft electric light constantly streams from mist and vapour into the atmosphere, enabling a traveller to see his road in the open country when there is no moon to guide him. This subject evidently interested Humboldt and Arago, who often allude to it in their writings. Similar observations have been made by Sabine, Rozier, Beccaria, and Deluc, and previously noticed by himself, but none have attempted to explain the phenomenon. The succeeding letter on the Chemistry of the Ocean is an admirable one, not the least interesting feature in it being the very readable manner in which he introduces the history of the discoveries of iodine and bromine, and his explanation of the nature and formation of mannite. Another matter which he explains very neatly is the reason for sending invalids to the sea-side, although chemical researches have shown that the air of the sea, unless it be taken in close proximity to the water, has precisely the same composition as that of the interior of continents. Why, then, do medical men constantly send their patients to the sea side for change of air? Dr. Phipson explains that the peculiary exhilarating sensation felt at the sea side is due to the density of the air at the level of the sea in comparison with its density on the mountain heights. Everyone knows that, *cæteris paribus*, the barometer always stands higher at the level of the sea than in any other locality, consequently that a pint of air weighs a little more at the sea side than a pint of air on the mountain side. But as our lungs have the same capacity wherever we happen to be, it is evident that at the seaside we breathe in a given time a greater weight of oxygen gas than anywhere else; and it is to this greater weight of vivifying oxygen introduced into the lungs at each inspiration that we owe the exhilarating and stimulating action by which the air of the sea is preeminently characterised.

But we have exhausted the space at disposal, although but one-fourth of Dr. Phipson's attractive little volume has been referred to, and have mentioned but three of the fourteen letters of which it is composed; it must, therefore, suffice to state that the interest of the reader is maintained to the last page, and that the same popular and easy style indicated by the references already made is adopted throughout. The science of sleep, somnambulism, and anæsthesia, the marvels of electricity applied, plant motion, firestones, observations, and experiments connected with atmospheric electricity, lightning prints, earthquakes, luminous animals, aërolites, life on the earth, and inhabited planets form the subjects of the remaining letters, every one of which will give rise to a large amount of useful and elevating thought. The manner in which the author has performed his task is creditable in the highest degree, and it can scarcely be doubted that it will induce many to contract a love for the investigation of natural phenomena and scientific curiosities who would never have done so without it. It it be as extensively read as it deserves to be, Dr. Phipson will certainly have no cause to complain that his labour has been fruitless.

* "The Complete Practical Machinist:" embracing lathe work, vise work, drills and drilling, taps and dies, hardening and tempering, the making and use of tools, &c. By JOSHUA ROSE. Philadelphia: Henry Carey Baird and Co. London: Sampson Low and Co.

† "Familiar Letters on Some Mysteries of Nature, and Discoveries in Science." By Dr. T. L. PHIPSON, F.C.S., &c. London: Sampson Low and Co., Fleet-street

FOREIGN MINES.

ST. JOHN DEL REY MINING COMPANY (Limited).—Advices received Oct. 2, 1876, per Mondego (s.), dated Morro Velho, Sept. 2:—

GOLD EXTRACTED TO DATE.—The produce for the second division of the month of August, being a period of 12 days, amounts to 14,803·6 oits. It has been derived as follows:—

	Oits.		Tons.		Oits. per ton.
From General mineral	6,730·5	from	12.0	=	5·516
Ore roughly freed from killas	6,972·5	,,	691	=	10·090
	13,703·0		1911		7·170
Re-treatment	1,100 6	,,	—	—	·575
Total	14,803·6	,,	1911	=	7·746

Equal to ....1706·6141 ozs. troy = ·8930 ozs. troy per ton.

The standard yield of the whole mineral treated is a little below that obtained for the same division of July. The proportionate yield of the general mineral, and the ore roughly freed from killas, remains about the same.

The general work of the establishment is going on with regularity at present.

Advices received Oct. 16, 1876, per Elbe (s.), dated Morro Velho, Sept. 17.

GENERAL OPERATIONS.—The general health of the establishment and district has much improved since the date of my last.

Though we have not yet perfectly recovered from the effects of the general illness, a considerable proportion of the patients have returned to their usual duties. By a little re-arrangement of the surface force withdrawing some 34 labourers from Bella Fama temporarily, we have been enabled to get the reduction work carried on successfully, and by keeping the mine force steadily employed at the essential positions, the more important mine work has been performed with regularity, and a fair amount of output of mineral has been accomplished. The hauling and pumping water-power has been sufficient. We have raised the amount of mineral required for the stamps supply without interruption.

PRODUCE FOR THE MONTH OF AUGUST.—The gold extracted during the month of August amounts to 39,224·2 oits. It has been derived as follows, viz.:—

	Oits.		Tons.		Oits. per ton.
From general mineral	17,940·0	from	3231	=	5·552
Mineral freed from killas	18,569 9	,,	1920	=	9·671
	36,509 9	,,	5151	=	7·082
Re-treatment of sand	2,714·3	,,	—	=	·526
Total	39,224·2	,,	5151	=	7·608

Or 39,224·2 oits. = 4521·9123 ozs. = 7·608 oits. = ·81778 ozs. per ton.

The produce for the previous month of July was 2138 oits. above this return; there were 198 tons more mineral pulverised, and the standard yield was better by ·123 of an oit. per ton. Had there been water-power to reduce the same quantity of mineral the difference in the produce between July and August would have been about 560 oits. A larger amount of sand was treated in August than in July.

COST AND PROFIT.

Taking the produce for August 39,224·2 oits.				
Deduct loss melting in bars ...... 381·2 ,,				
38,843·, at 7s. 9d. per oit. =	£15,051	13	3
Cost		7,169	11	3
Leaving a profit for the month of August	£	7,882	2	0

The cost is about 400*l.* more than it was in July, being 100*l.* in labour, and the remainder in other general charges.

Exchange is one farthing lower than it was in July. The produce was worth about 900*l.* more in July, and this is the chief cause of the lower profit shown in August.

MINE DEPARTMENT.—The large number of miners on the sick list impeded our timberwork very much *pro tem.*, but at present we have a good force engaged in this essential work, which is now being brought up as closely as practicable. The hauling is going on, raising pretty regularly average output of mineral, and there is a moderate stock on the spalling floors. We commence to-day to bore and draw ore from the eastern section of the mineral up close under the roof; this will give us a purer ore than we have been getting in the western part, but we shall not have such large duty for each borer employed.

REDUCTION DEPARTMENT.—The gold obtained during the first division of September, being a period of eight days, amounts to 9719·8 oits. It has been derived as follows:—

	Oits.		Tons.		Oits. per ton.
From general mineral	4189·0	from	860	=	4·870
Mineral freed from killas	4848·5	,,	459	=	10·563
	9037·5	,,	1319	=	6·851
By re-treatment of sand	682·3	,,	—	=	·517
Total	9719 8	,,	1319	=	7·368

Equal to ... 9719·8 oits. = 1120·5316 ozs. troy = 7·368 oits. = 8·495 oz. per ton.

The above return is little under the average yield for the month of August. We shall have a better quality of mineral during the remainder of the month.

RICHMOND CONSOLIDATED.—Telegram: Week's run, $48,000; two iron furnaces stopped for want of sufficient blast.

— R. Rickard, Sept. 28: The winze begun below the 800 drift is looking very well, and although the ore is not of high grade it looks very promising. Nothing has been done in the 700 drift since my last. The 60 ft. drift, driving towards the southern part of the high stope, has entered lime shale; the ore from the high stope is making down strong, and we have every reason to expect a large body of ore in this direction. We shall have to drift at least 150 ft. to get under the present workings. The high stope is looking very well, and seems to be entending in every direction as it is opened on. The drift in the 400 has not yet met with any ore; it has been extended 120 ft. from the main drift. All other parts of the mine are about the same as last reported.—Smelting: The past week the furnaces have done a large amount of work, the ore smelted has not been of so high a grade as we have been smelting, and the returns have been consequently lower. The stone furnaces are holding out well, and shall be able to run them some time yet without stopping for repairs.

BIRDSEYE CREEK.—Telegram from Mr. G. S. Powers: We have cleaned up after a run of 60 days. The gross returns are $15,250; the profit is $2750. I send you a remittance of $15 0.

BLUE TENT CONSOLIDATED.—Telegram from Mr. Thomas Price: We have cleared up on South Yuba claim after a run of 20 days. The gross returns are $7750; the profit is $5000.

EBERHARDT AND AURORA.—The directors have received a further shipment of 16 bars of silver, valued at present price about 3700*l.*

MALPASO.—Telegram from superintendent: We have cleaned up after a run of 31 days, during which time we have washed 440 hours; gross returns $4000 (800*l.*)

ALMADA AND TIRITO.—Telegram from Mr. Breach: Sinking from the 32 to the 42 on the ore discovered some time since, and near where the rich stones of copper ore were raised, and it looks promising at the 37. Freight engaged 300 tons.

PITANGUI.—Mr. Hilcke, Pari, Sept. 14: The driving of the adit had been carried on satisfactorily during August, and from the 18th to the end of the month it had been extended 2 fathoms in new ground. Up to Aug. 31 a total length of 18 fathoms of this adit had been completed.

SANTA BARBARA.—Mr. Hilcke, Pari, Sept. 14: During the month of August 1124 tons of mineral were stamped, yielding 3·682 oits. per ton, or a total of 4139 oits. of gold, which, valued at 8s. 6d. per oit., amounts to 1759*l.* 1s. 6d., as the estimated value of the produce for the month. The mine working cost for the same period was—at Exchange, 25½d., 969*l.* 12s. 10d., thus leaving an estimated profit of 789*l.* 8s. 8d. for August. The capital expenditure during the month on five stamps and new Senzala, amounted to 155*l.* 4s. 2d.—The Mine: Stope No. 1; The lode in the end of this stope, which has been running rather flat for some distance, was making a steeper underlie. The lode in No. 2 stope had undergone little or no change. The lode in the bottom of No. 1 stope is 10 ft. wide, and in the middle part 12 ft. wide, of fair quality mineral. No. 1 shaft has been sunk 11 ft. on the course of the lode during the month, being on Aug. 31 a depth of some 17 fms. below the adit level. The lode in the shaft has improved much in the distance sunk during the month, and was from 7 to 8 ft. wide, producing throughout fair quality mineral for the stamps. The lode in the No. 2 south stope was opening out well, and producing first-class mineral. The lode in the north stope was much the same as last reported. The quantity of ore raised during the month amounted to 1354 tons, of which 230 tons were rejected as refuse stone, and 1124 tons treated at the stamps. Average quantity of ore raised per borer for the month 30 tons.—[The directors have declared an interim dividend of 1s. 3d. per share for the half-year ending June 30, payable on Oct. 20.]

CEDAR CREEK.—J. B. Ludlum, Oct. 18: Yankee Tunnel: In my last I mentioned that the rock was very unfavourable. It continued so throughout the week, notwithstanding we used a larger amount of powder than is usual. Everything worked smoothly, and we neither lost a shift or a shot. We only advanced 36 ft. The following week ending Sept. 23 it changed, and improved, so that notwithstanding we lost one face shot, we advanced 43 ft. I expect to connect with the shaft by Oct. 15.—Baker's Shaft: This work is nearly completed. During the two weeks ending Sept. 23 we sunk 24 ft., which, added to previous reports, gives 146 ft.—Baker's Claim: The men engaged fitting up this claim are doing well. The string of pipe leading down into the pit from our large supply pipe is laid ready for water. The incline is being run down from the surface, and as soon as the shaft is completed I intend also to commence from that point, and run upwords until the two forces meet. On Monday next we will be ready to remove the derrick preparations, for the construction of the sluices in the tunnel below have been advanced as far as possible. The timber for the bottoms and sides is sawn, and ready for hauling; the posts, sills, and braces for ribs are cut and framed; the blocks for paving the bottom are on the ground, and, in fact, everything is in readiness for the completion of this work in the shortest possible time.—Repairs: I have made arrangements to commence next week on the work of cleaning ditches and repairing flues, which I am pleased to report are very light as compared with former years. I intend, as heretofore, to simply patch up, and only do new work where it is absolutely necessary.—Ditches: Our lower or distributing ditch system is complete.—Distributing Reservoir: The reservoir at the head of our large pipe, and also the one at Atla, are so nearly filled with sediment that it is necessary to sluice them out. The work on the former is nearly completed. The work on the latter cannot be done until we can obtain water. The cost will be light.

JAVALI.—Sept. 6: The directors have received communication from the manager confirming telegram already announced—that the mill had worked 23½ days, crushing 1975 tons of quartz, yielding 704½ ozs. of gold, at an average of 7 dwts. 3 grs. The expenditure had been 963*l.* 12s. 6d.; the board value the remittance at 1650*l.* Capt. Sohns reports that the mine is in excellent condition, and anticipates that the tailing mill will be completed in the course of two months from the above date.

BLUE TENT.—D. T. Hughes, Oct. 16: During the week we washed very successfully in South Yuba claim, more so than we have for some time past; did not have a very great quantity of cement to contend with, and the streams worked favourably on the bank, everything looks promising for a good clean up next time. We also progress favourably with our work at the Enterprise, and nearly over the most expensive portion of the job; have also completed our telegraph line to the South Yuba claim, having four stations on the line—one at office, reservoir, Enterprise pit, and South Yuba claim; the line works well, and have constructed it at a trifling expense; we find it of much service to us already, as it brings all the claims in close proximity with the office, also the water agent, and saving much unavoidable travelling.

CONDES.—Mr. J. Seccombe writes, Sept. 1: I presume the foreman smelter has been dispatched ere this, and that he will shortly be here. (He sailed from Liverpool on Aug. 23.) Until he arrives nothing will be done by way of smelting; but I am getting the old reverbatory furnace repaired (it was completely worn out), and shall probably have it ready for use when the smelter arrives. I am also getting the turbine put in condition to work the blast-furnace. I have entered into a contract for 12 months for the whole of the carriage to and from the mines Corral, Quemado, and Santiago. On the 29th ult. I dispatched the first batch of men for the mines. In two or three days I go myself, and shall probably be there as soon as they can reach up, as the road up the mountain is no doubt filled with snow, a considerable quantity having fallen the last 10 days, which must be cleared away. The usual time for opening the mines in this district appears to be Oct. 1. Last year the men did not go to the Isolina till Nov. 1. Before that time I shall hope to have some ores shipped for England. If I get up to the mines all right with the men I shall send you a telegram to advise you that the workings have been resumed. (On Sept. 16 he telegraphed: Operations resumed, and lode generally turning out equal to my expectations.)

ARGENTINE.—Capt. Coward reports for July: South Mine, Section Captain: In the 44 cross cut east we have intersected a branch about 1 ft. 6 in. wide, composed of pyrites and gossan. A sample from it assayed 9 dwts. of fine gold, and 2 ozs. 6 dwts. of fine silver; ground much easier since passing through branch. In the 20 cross-cut good progress has been made; the ground is granite.—Section Chairman: The lode in the adit level cross-cut is without change, being still 3 ft. wide and producing good work for stamps.—Pique: In the back of the 44 north, on the direction of the run, we have discovered old men's workings on a cross course, which has evidently been worked upon upward and eastward for a considerable distance, and down as far as water would permit. A sample taken from it assayed 9 dwts. 16 grs. of fine gold, and 4 dwts. of fine silver per ton, and another taken from pieces of ground standing on eastern side, assayed 2 ozs. 2 dwts. 11 grs. (?gold) and 1 oz. of fine silver. In the 44 cross-cut east we have cut a deposit of ore, probably formed from the intersection of a cross-course with the lode, which is apparently heaved east (say) 3 to 4 fms.; we have opened upon it about 7 fms. Its width in the north end is fully 12 feet, and in the south end, where we have met with limestone, 3 feet. An average sample of the fair part, which appears to be overlying the hard part, assayed fine gold 9 dwts. 2 grs., fine silver 16 dwts. 8 grs. A sample taken of the hard part of the lode exposed on the eastern side of the level, and nearest the bottom, assayed fine gold 2 ozs. 2 dwts. 15 grs. per ton, with only a trace of silver.

Reduction Works: We have treated about 500 tons of ore, principally desmontes from the run at Piqué, and extracted bar gold 127 ozs. 19 dwts. 5 grs.; these results are far from satisfactory, which must not be ascribed to any fault of the mines or the ore, but to the incomplete state of our reducing appliances from the want of cement, calcining powder, and buddles. The building of new calcining furnace has not progressed so rapidly as expected, owing to difficulties in getting sufficient sandstone cut and brought from the quarry. However, every effort is being made to push it on, and it will be completed at the latest about the middle of August. There are 156 13 hands employed on the average.

A supplementary letter (August 23) says—In the "Captain" and "Chairman" we have done nothing towards driving, not being able to afford men for the pla... The workings suspended in these two sections are highly important, and s... be resumed at the first opportunity. In the Piqué, the 44 north has been ... during the month without hindrance; the lode is large and promising, but ... slow for progress.—Run: All the debris from the run has been removed, and w... have now six men stoping south of cross cut at the 44 in original ore. The splendid lode going down in the bottom in both directions, and more esp... away south. We have resumed the sinking of underlie shaft from Monti Plat. It is down 5 fms., in speedy ground for sinking, and producing ore which will pay for stamping.—Reduction Department: We have done badly in the reduction department, owing to a scarcity of wood and to the causes stated in my former communication. In consequence of a snowstorm, and to an attempt of the woodmen to raise the price of wood, we have been unable to work the stamps for eight days this month. I am glad to say that we are now well supplied with wood, as more carriers have come on, and I think we shall have no more difficulty on this question, at least for some time to come. The new calcining furnace was put to work on the 18th inst., and is doing its work remarkably well. The ore treated up to the 18th inst. was of the same class as that of last month. Since then we have been stamping ore of much better quality, principally from the bottom of Piqué, which is giving satisfactory results, considering the imperfect state of our appliances.

BATTLE MOUNTAIN.—Two reports upon the property have been issued by the directors. The one is a special report of Capt. James Nancarrow. The concentration works are at Willow Creek, three miles from the mines, where there is an adequate supply of water for all purposes, and at all seasons of the year; and the engine is of ample power for the stone-breaker, crusher, and jigging machinery. Four double jigging machines are at work, and two in the course of erection; these he considers will return 6 to 7 tons per day of from 25 to 30 per cent. copper ore. The road from the mine to Willow Creek is in good condition. The bottom of the mines are under water, but above water level there is second-class ore, which, with that at surface, will supply the mill at the present rate of working for years to come. He does not advise going deeper at present, as the second class ore above water level will, he considers, hereafter cover cost of the necessary machinery. He recommends that "the assessment may be done" on outlying claims of the company, so as to retain them for future operations. Capt. Joseph Richards, in his annual report, says that it will be remembered that in all mines, or nearly so, the best portion is found under water level, the ground as well as the ledges there assuming a more settled and permanent character; and considering that about 4500 tons of first-class ores have been raised and sold from a depth of 330 ft., or (say) 55 fms. only, what better proof can be needed than that a continuation of the deepening of the mine would be attended with the most successful results. He questions if there is any copper ore mine in the world which can show richer ores. In the 330 fm. level stopes, a drift forward therein, there is a most promising lode, spotted with ore; and in the stopes in the 73, near virgin, some good ore for concentration is being raised, and he hopes when they start the mill again that they may have better success. Of the success of deepening the mines, with prospects so good, he has no doubt, and trusts the directors will be pleased to order the small engine necessary as soon as possible.

CAPE COPPER.—Capt. Tonkin, Aug. 31: Ookiep: The bottom drivings in the eastern part of the mine have not materially changed since last report. These levels have not been pushed vigorously during the month in consequence of the accumulation of stuff in the 80 fm. level stope, and just now we have suspended the south level in order to open out a large stope near the forebreast of the driving. The stope in the 80, near the bottom of the No. 19 winze, yielded a splendid heap of copper ore in the past month, and at the present time it looks well. The 80, north from the shaft on flookan course, has been driven out for a considerable distance as a trial, and we have lately intersected a nice branch of copper ore which seems to run east and dip north, but I am not prepared to say whether this is a discovery of much value or not, as we have not yet had time to open the ground. If this proves to be a good bunch of ore we shall have to hasten our preparations to deepen the shaft. The 68 fm. level east from No. 13 winze is now in a soft channel of ground, which produces a little copper ore, but not enough to value. No. 20 winze, below the 58, is now communicated to the level below, and of course the ventilation in the eastern part of the mine is still further improved. The stopes in the various levels throughout the mine continue to give out the estimated quantities of copper ore, and on the whole they promise well for the future. We still suffer through the want of labour on the dressing-floors, but now that the winter months are passed we hope to get a full supply of labourers for a considerable time to come.

Spectakel.—Capts. Tonkin and Ninnis, Aug. 25: We have no favourable changes to report in any of the points now being opened out. The stopes throughout the mine are very poor indeed, and unless we shortly intersect something of value we shall be obliged to contract our operations to the carrying out of trials and dressing the remainder of surface reserves.

Trial Mines.—Captains Tonkin and Lanksbury, Aug. 15: The 20 fm. level, east from shaft, at Karolusberg, is in poor ground, but the forebreast of the driving is showing some stains of copper, and the vein appears to be increasing in width. The 10 fm. level east is spotted with copper ore throughout the whole size of the driving, but there is not enough in bulk to pay for dressing. The winze which is being sunk below the 10 fm. level yields a little copper ore, but not enough to value.——The 17 fm. levels, at Nababeep, are rather poor, but the stope in the back of the same is worth 3 tons of copper ore per cubic fathom.——In driving north from old workings, at Kilduncan Mine, we have intersected a small run of copper-bearing ground, which produces a few stones of good ore, consequently we shall continue this trial for some time.——At Narrap there is no change to notice, as we are making but slow progress in effecting a communication between the 10 and 20 fathom levels.

Returns for August: Yield from Ookiep, 850 tons of 29 per cent. From Spectakel, 37 tons of 26 per cent.—Bills of Lading Received: 400 tons of ore per Corsair, and 400 tons per Nelson.—Arrivals at Swansea: The Muriel, Delta, Aneroid, Rose of England, and Ocean King.—Sales by Public Ticketing: 480 tons of ore on Sept. 12, at an average of 13s. 11¼d. per unit, realising approximately 8750*l.*; 330 tons on Sept. 26 at an average of 14s. 1½d. per unit, realising approximately 6750*l.*, and 630 tons on Oct. 3 at an average of 14s. 5d. per unit, realising approximately 12,000*l.*—Put Forward for Sale: 690 tons of ore on Oct. 24.—[Dividend paid, Sept. 29, 20s. per share, free of income tax.]

[For remainder of Foreign Mines, see to-day's Journal.]

I.X.L. MILL.—Within the next two weeks 70 tons of machinery will be shipped from the Vulcan Ironworks, San Francisco, for this mill, 35 tons having been shipped last Monday. A large force of mechanics from San Francisco will be on the ground on Monday next. Quite a large amount of timber is on the ground, and grading will be finished on Saturday next. The curve of the road at the I.X.L. Mill site is being straightened—a much needed improvement. The I.X.L. Mill boarding-house, under the management of Emmons Spencer, of Monitor, will be opened on Monday next.—*Alpine Chronicle*, Sept. 23.

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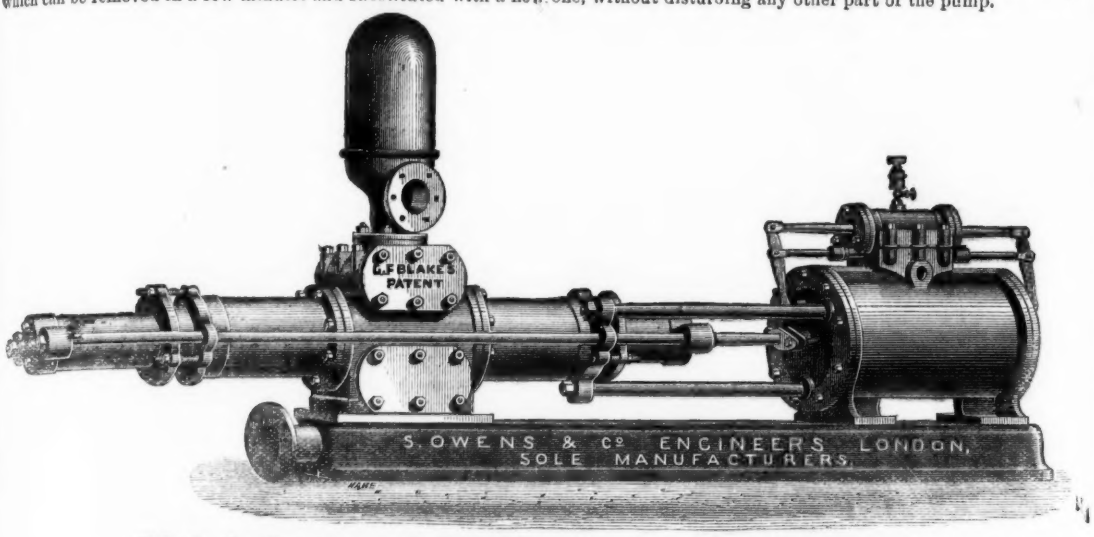
Hydraulic and General Engineers, Whitefriars-street, London;

And at 195, Buchanan-street, Glasgow (W. HUME, AGENT).

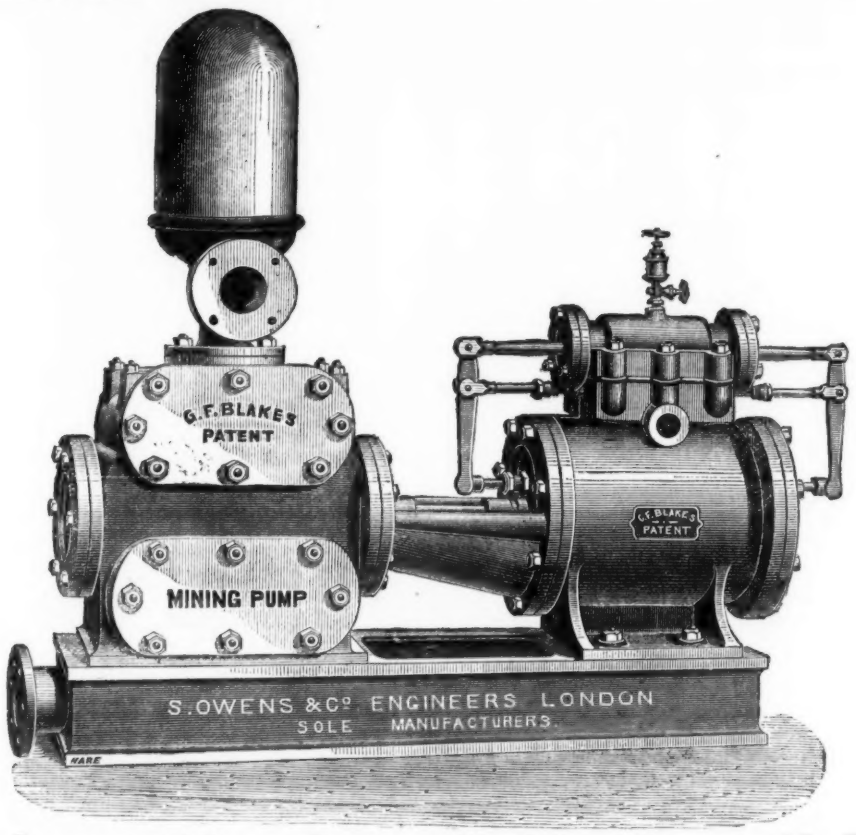
These PUMPS from their SIMPLICITY, RELIABILITY, DURABILITY, and ECONOMY are SPECIALLY SUITED FOR MINING PURPOSES, where large quantities of water require to be raised from great or medium depths with CERTAINTY. They are double-action in their construction, throwing a constant stream of water, can be made of any stroke to suit the space in which they have to work, can be arranged with any combination of steam and water cylinders to suit the pressure and lift against which it is desired to work them, are made of the very best materials and highest class of workmanship, and all working parts can be readily got at by any ordinary workman, and replaced if necessary by a duplicate part (all such being interchangeable) in the shortest possible time. For situations where gritty and sandy water has to be pumped the DOUBLE-PLUNGER PATTERN is recommended. Where space is limited the PISTON PUMP is better suited, a novel feature of which is the PATENT REMOVEABLE LINING, which can be removed in a few minutes and substituted with a new one, without disturbing any other part of the pump.



Blake's Improved Double-plunger Steam Pump.

S. OWENS AND CO.,

In placing the BLAKE STEAM PUMP before the mining world, believe they are offering the BEST, MOST RELIABLE, and ECONOMICAL PUMP that has yet been made, and solicit an inspection of various sizes in operation at their works, Whitefriars-street, Fleet-street, London.



Blake's Improved Mining Pump, with Patent Removeable Lining to Pump Cylinder,

Any combination of these Pumps may be had to suit circumstances. The following are some of the SIZES SUITABLE FOR MINING PURPOSES:—

Dia. of steam cylinders.. In.	12	12	12	12	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	24	24
Dia. of water cylinders.. In.	3	4	5	6	4	5	6	4	5	6	8	4	5	6	8	5	7	8	9	6	8
Length of stroke ..... In.	18	18	18	24	24	24	24	24	24	24	24	24	30	30	30	30	30	36	36	36	42
No. of strokes per minute..	30	30	30	30	25	25	25	22	22	22	22	22	22	22	22	20	20	17	17	17	15
Quantity in gallons per hour, approxmately ...	1440	2610	4200	5940	2940	4620	6600	2646	4158	5940	10620	2646	5160	7500	13260	4586	9000	12360	15660	6720	20

PRICES FOR THE ABOVE, OR ANY SPECIAL SIZE, AND ILLUSTRATED CATALOGUES FURNISHED ON APPLICATION.

PATENT CONDENSORS

Can be supplied for any size pump to effect a saving of fully 30 per cent. in the consumption of fuel, greatly increasing their efficiency.

The Blake Pump will work under water, and as efficiently with compressed air as with steam.

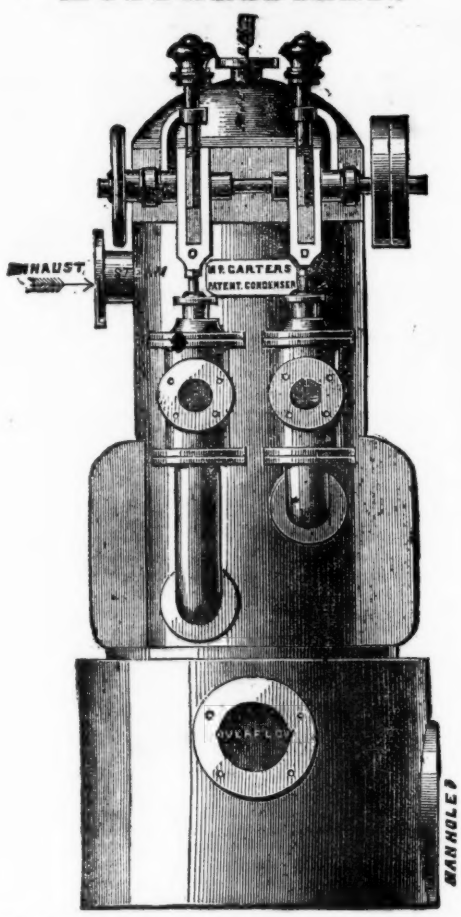
BLAKE'S DONKEY PUMPS FOR FEEDING BOILERS KEPT IN STOCK.

LICENSED MAKERS.

KIRK, RAMSDEN, AND CO.

(LIMITED),

HUDDERSFIELD.



These Condensers can be placed inside or outside of the engine-house. They draw their own injection water, and require no foundation. Specially adapted to Pumping and Winding Engines, effecting a saving from 20 to 30 per cent. in coal, and increases the power of the Engine.

Engineers, Millwrights, Founders,

AND

FORGE PROPRIETORS.

Makers of Pumping, Winding, and Blowing Engines, Condensing and Non-condensing.
Horizontal and Beam Engines for all purposes.

DUNN'S ROCK DRILL,

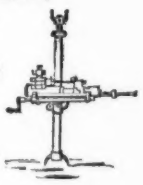
AND

AIR COMPRESSORS.

DRIVING BED ROCK TUNNELS, SINKING SHAFTS, AND PERFORMING OPEN FIELD OPERATIONS,

IS THE

CHEAPEST, SIMPLEST, STRONGEST, & MOST EFFECTIVE DRILL IN THE WORLD.



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(W. W. DUNN AND CO.),

LONDON, E.C.

JOHN AND EDWIN WRIGHT,

PATENTEES.

(ESTABLISHED 1770.)

MANUFACTURERS OF EVERY DESCRIPTION OF IMPROVED

PATENT FLAT AND ROUND WIRE ROPES

from the very best quality of charcoal iron and steel wire.

PATENT FLAT AND ROUND HEMP ROPES,

SHIPS' RIGGING, SIGNAL AND FENCING STRAND, LIGHTNING CONDUCTORS, STEAM PLOUGH ROPES (made from Webster and Horsfall's patent steel wire), HEMP, FLAX, ENGINE YARN, COTTON WASTE TARPAULING, OIL SHEETS, BRATTICE CLOTHS, &c.

UNIVERSE WORKS, MILLWALL, POPLAR, LONDON.
UNIVERSE WORKS, GARRISON STREET, BIRMINGHAM.
CITY OFFICE, No. 5, LEADENHALL STREET, LONDON, E.

BENNETTS' SAFETY FUSE WORKS,

ROSKEAR, CAMBORNE, CORNWALL.

BLASTING FUSE FOR MINING AND ENGINEERING PURPOSES,

Suitable for wet or dry ground, and effective in tropical or Polar Climates.

W. BENNETTS, having had many years experience as chief engineer with Messrs. Bickford, Smith, and Co., is now enabled to offer Fuse of every variety of his own manufacture, of best quality, and at moderate prices.
Price Lists and Sample Cards may be had on application at the above address.
LONDON OFFICE.—H. HUGHES, Esq., 95, GRACECHURCH STREET.

ONE MILLION STERLING

Has been paid as
COMPENSATION FOR DEATH AND INJURIES
Caused by
ACCIDENTS OF ALL KINDS,
By the
RAILWAY PASSENGERS ASSURANCE COMPANY.

Hon. A. KINNAIRD, M.P., Chairman.
PAID-UP CAPITAL AND RESERVE FUND £180,000.
ANNUAL INCOME, £200,000.
Bonus allowed to Insurers of Five Years' standing.
Apply to the Clerks at the Railway Stations, the Local Agents, or—
64, CORNHILL, and 10, REGENT STREET, LONDON.
WILLIAM J. VIAN Secretary.

PARIS EXHIBITION, 1867.

VIENNA EXHIBITION, 1873.

LONDON EXHIBITION, 1874.

CORNWALL POLYTECHNIC SOCIETY, 1867 and 1873.

TANGYE BROTHERS AND HOLMAN,

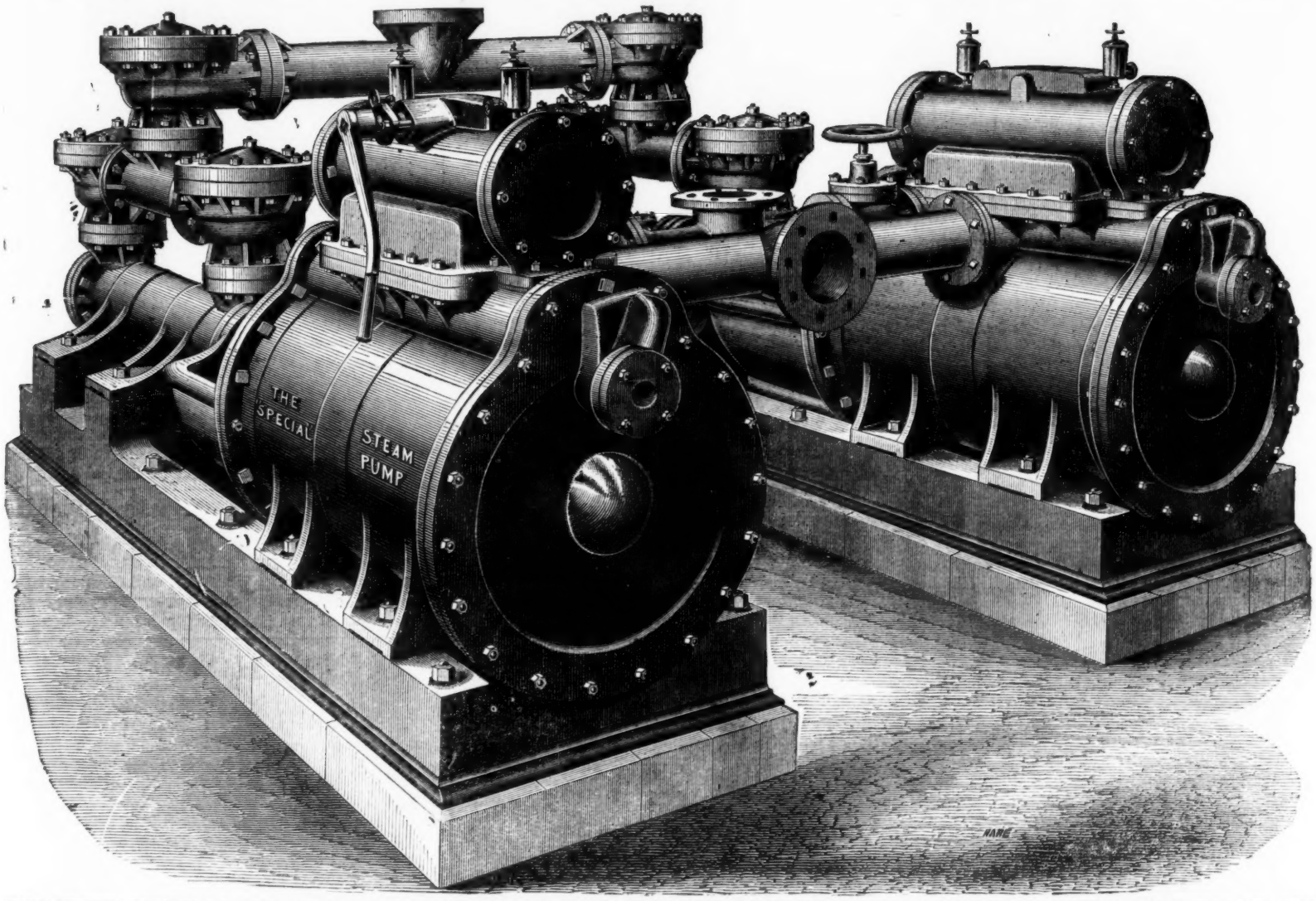
10, LAURENCE POUNTNEY LANE, LONDON, E.C.,

AND BIRMINGHAM, (TANGYE BROTHERS), CORNWALL WORKS, SOHO

THE "SPECIAL" DIRECT-ACTING STEAM PUMP.

OVER 12,000 IN USE.

SUCCESSFULLY ADOPTED IN A LARGE NUMBER OF MINES IN THIS COUNTRY AND ABROAD.



PAIR OF THE "SPECIAL" DIRECT-ACTING STEAM PUMPS SUITABLE FOR HIGH LIFTS IN MINES, SIMILAR TO MANY SUPPLIED BY TANGYE BROTHERS AND HOLMAN.

The following extracts from a letter, received by Tangye Brothers and Holman, from J. Bigland, Esq., dated Feb. 25, 1875, refers to a "Special" Direct-acting Steam Pumping Engine supplied four years ago to Messrs. Joseph Pease and Partners, for the Adelaide Colliery, Bishop Auckland. The engine is throwing about 8000 gallons per hour, 1040 feet high, in one direct ilft:—

"The underground pumping engine at Adelaide Colliery is working night and day. It does its work satisfactorily, and gives us very little trouble. Some of the cup leathers which form the plunger packing have worked three months. The working barrel is in beautiful condition. The average duration of the valve seats is about eight months; they work and keep tight as long as there is a bit of them left. I expect the valves (Holman's patent) and the buffers will last as long as the colliery."

Extract from a letter received by Tangye Brothers and Holman from W. H. Eagland, Esq., dated Feb. 27, 1875, in reference to a "Special" Direct-acting Steam Pumping Engine supplied two years ago to the West Yorkshire Iron and Coal Company near Leeds, to throw 16,000 gallons per hour, 465 feet high in one direct lift:—

"It is at work night and day. Our man goes down to the pump twice a day (Ten A.M. and Four P.M.), to supply the tallow cups. After this it is left every day till he comes next morning, when he goes down again at Ten A.M. as before. The only repairs the pump has had for 12 months are one bucket, which had worked since we got the pump, and one valve seat, but no valve, so it has cost very little. Its first lift is 70 yards perpendicular, then the water passes up pipes for half a mile, ascending another 70 yards, and then another perpendicular pipe of 15 yards —total, 55 yards vertical height.."

Extract from the Official Report of the Commission of the German Empire on the Vienna Exhibition of the 1873, treating on Pumping Engines:—

"Contrary to these older pumping engines exhibited, there is now nearly everywhere the opinion established that the ('SPECIAL') pumping engines placed underground, which are made on A. S. Cameron's principle by Messrs. Tangye, are preferable to all. They do much duty combined with great compactness. They dispense entirely with the troublesome rod arrangement, giving often rise to stoppages, so that they will be applied shortly to a great extent, and are already in use in many localities. There is no doubt that this is in every respect practical system will command a general adaptation."

200 SIZES AND COMBINATIONS OF THESE PUMPS ARE NOW MADE.

The following are a few of the Sizes for High Lifts in Mines:—

Diameter of Steam Cylinder .....In.	7	8	9	9	10	10	12	12	12	14	14	14	16	16	16	16	18	18	18	18	21	21	21
Ditto of Water Cylinder .....In.	3	3	3	4	3	4	3	4	5	4	5	6	4	5	6	7	5	6	7	8	5	6	7
Length of stroke.....In.	24	24	24	24	36	24	36	36	36	36	36	36	36	36	36	36	48	36	36	36	48	48	36
Gallons per hour approximate	1830	1830	1830	3250	1830	3250	1830	3250	5070	3250	5070	7330	3250	5070	7330	9750	5070	7330	9750	13,000	5070	7330	9750
Height in feet to which water can be raised with 40 lbs. pressure per sq. in. of steam or compressed air at pump	325	425	540	300	665	375	960	540	345	735	470	330	960	615	426	312	775	540	400	300	1058	740	540

CONTINUED.

Diameter of Steam Cylinder .....In.	21	21	21	24	24	24	24	24	26	26	26	26	26	30	30	30	30	30	32	32	32	32	32
Ditto of Water Cylinder .....In.	8	9	10	6	7	8	9	10	7	8	9	10	12	8	9	10	12	14	8	9	10	12	14
Length of stroke.....In.	36	36	36	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Gallons per hour approximate	13,000	16,519	20,000	7330	9750	13,000	16,519	20,000	9750	13,000	16,519	20,000	30,000	13,000	16,519	20,000	30,000	40,000	13,000	16,519	20,000	30,000	40,000
Height in feet to which water can be raised with 40 lbs. pressure per sq. in. of steam or compressed air at pump	413	326	264	960	700	540	427	345	827	633	500	405	282	840	665	540	375	275	960	758	625	426	313

PRICES OF THE ABOVE ON APPLICATION.—FOR SIZES AND PRICES OF PUMPS FOR LOWER LIFTS SEE SEPARATE LIST.

HOLMAN'S PATENT CONDENSER will be found a great acquisition to all kinds of Steam Pumps, as not only is the exhaust steam completely condensed, and the annoyance from same blowing off entirely got rid of, but a vacuum is obtained in the steam cylinder saving from 20 to 50 per cent. in fuel, and increasing to a considerable extent the economy and efficiency of the Pump.

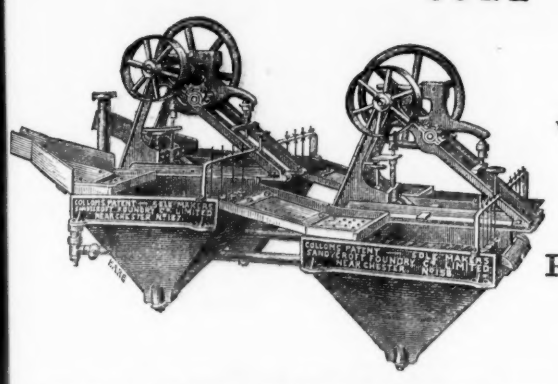
NORTH OF ENGLAND HOUSE ... ... TANGYE BROTHERS AND RAKE, ST. NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.
SOUTH WALES HOUSE... ... ... TANGYE BROTHERS AND STEEL, Tredegar Place, NEWPORT, Mon.; and Oxford Buildings, SWANSEA.

PATENT IMPROVED ORE WASHING & DRESSING MACHINES.

THE SANDYCROFT FOUNDRY & ENGINE WORKS CO. (LIMITED), NEAR CHESTER

LATE THE MOLD FOUNDRY CO. (ESTABLISHED 1838).

SOLE MAKERS IN GREAT BRITAIN.



HUNDREDS IN USE.

FULL PARTICULARS,
PHOTOGRAPHS, TESTIMONIALS, AND PRICES,
UPON APPLICATION.

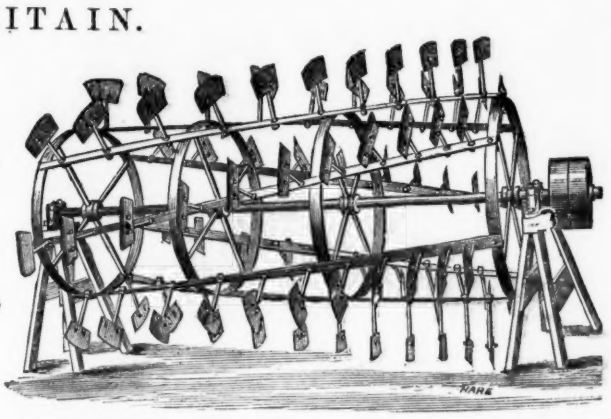
Will supply Designs, and all the necessary Plant for laying out Dressing Floors; also

MANUFACTURERS OF EVERY VARIETY OF

MINING MACHINERY,

PUMPING & WINDING ENGINES,

PITWORK, CRUSHING MILLS,
ROLLS
OF PECULIARLY HARD AND TOUGH MIXTURE
&c., &c.



COLLOM'S PATENT AUTOMATIC ORE WASHING MACHINE, working at the following and many other Lead, Copper, Blende, and Tin Mines:—Great Laxey, Cape Copper, Pontgibaud, Linares, Alamillos, West Tolgus, Lisburne, Minera Halvans, Snailbeach, &c.; and also at Messrs. Vivian and Sons' Works, Swansea.

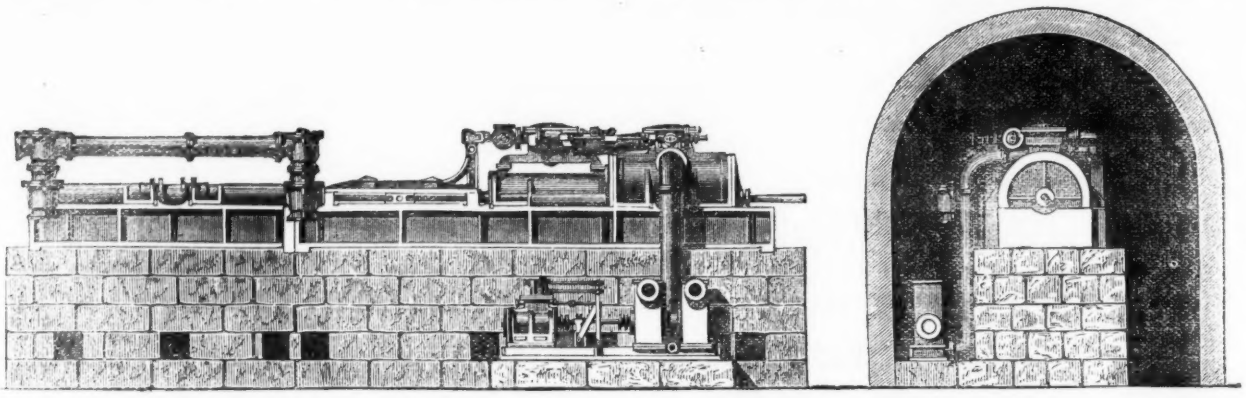
PATENT IMPELLER, OR KNIFE BUDDLE, in use at the following and many other Lead, Copper, Blende, and Tin Mines:—The Van, Roman Gravels, Tankerville, Ladywell, Lisburne, East Black Craig, Old Treburgett, Penhale & Barton, Bog, Linares, Fortuna, Alamillos, Minera Halvans, &c.

LONDON OFFICE: 6, QUEEN STREET PLACE, E.C.

HATHORN, DAVIS, CAMPBELL, AND DAVEY,

MAKERS OF

The Differential Pumping Engine, Hydraulic Pumping Engines, Cornish Engines, Differential Blowing Engines, Compound Rotative Engines, the Separate Condenser, Hydraulic Machinery, Mining Plant of all kinds, and Machinery for Water Supply, Irrigation, &c.

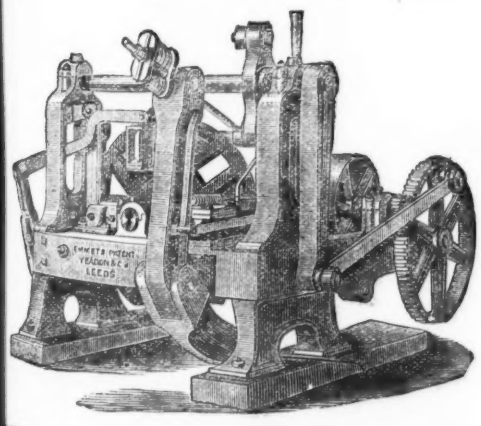


THE COMPOUND DIFFERENTIAL ENGINE AND FORCE PUMPS,

With Separate Condenser, as applied Underground, forcing 700 gallons per minute 920 feet high.

SUN FOUNDRY, LEEDS.

FURTHER PARTICULARS ON APPLICATION



EMMET'S

A1 PATENT BRICK MACHINE.

Massive; durable; cheap; takes little power, and gives PERFECT SATISFACTION.

This is the ONLY Machine which presses the Brick equally on BOTH sides, each plunger entering the mould plate $\frac{3}{16}$ in., and turning out 12,000 SQUARE, SOLID, PRESSED Bricks per day, READY AT ONCE FOR THE KILN.

SOLE MAKERS--

YEADON AND CO.,

CROWN POINT FOUNDRY, LEEDS,

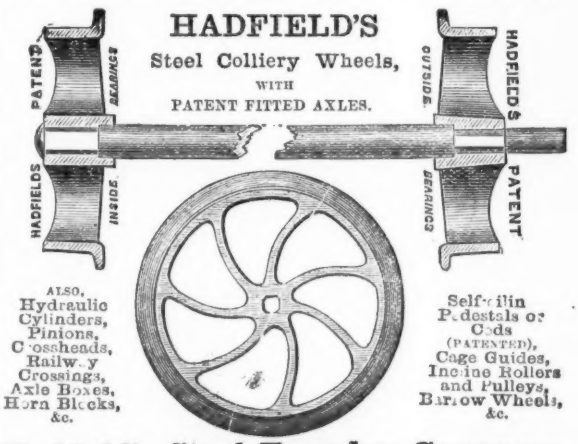
Makers of EVERY DESCRIPTION of Colliery and Brick Yard Plant.

LONDON AGENTS—
HAUGHTON AND CO., No. 122, CANNON STREET, E.C.
CONTINENTAL AGENTS—
PLAMBECK AND DARKIN, 171, QUEEN VICTORIA ST., E.C.

TO COLLIERY PROPRIETORS, MINING ENGINEERS, &c.

HADFIELD'S

Steel Colliery Wheels,
WITH
PATENT FITTED AXLES.



ALSO,
Hydraulic Cylinders, Pinions, Crossheads, Railway Crossings, Axle Boxes, Horn Blocks, &c.

Self-oiling Pedestals or Cods (PATENTED), Cage Guides, Incline Rollers and Pulleys, Barlow Wheels, &c.

Hadfield's Steel Foundry Company,

MANUFACTURERS OF EVERY DESCRIPTION OF

CRUCIBLE CAST STEEL CASTINGS.

ATTERCLIFFE, SHEFFIELD.

ARTESIAN BORINGS,

For WATER SUPPLY to TOWNS, LAND IRRIGATION, and MINERAL EXPLORATIONS, may be executed of any diameter, from 6 in. to 36 in., and to any depth to 2000 ft.,

stons & Air-pump Buckets fitted with Patent Elastic Metallic Packing

of which upwards of 8684 have been made to March, 1875.

MATHER AND PLATT,

MAKERS OF LARGE PUMPS AND PUMPING ENGINES.

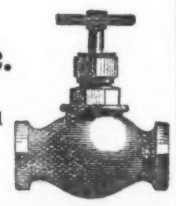
Improved Valves and Taps for Water, Steam, Gas, &c.

PATENT STEAM EARTH-BORING MACHINE

ENGINEERS and MACHINE MAKERS to CALICO PRINTERS, BLEACHERS, DYERS, and FINISHERS.

SALFORD IRONWORKS, MANCHESTER,

PRICES AND PARTICULARS ON APPLICATION.



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HOPTON'S CONVERSATIONS ON MINES, between Father and Son. The additions to the work are near 80 pages of useful information, principally questions and answers, with a view to assist applicants intending to pass an examination as mine managers, together with tables, rules of measurement, and other information on the moving and propelling power of ventilation, a subject which has caused so much controversy.

The following few testimonials, out of hundreds in Mr. Hopton's possession speak to the value of the work:—

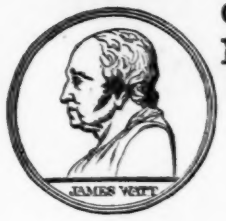
"The book cannot fail to be well received by all connected with collieries."—*Mining Journal.*

"Its contents are really valuable to the miners of this country."—*Miners Conference.*

"Such a work, well understood by miners, would do more to prevent collier accidents than an army of inspectors."—*Colliery Guardian.*

London: MINING JOURNAL Office, 26, Fleet-street; and to be had of all book sellers.

BUYERS are CAUTIONED against Purchasing any Infringements of H.R.M.'s Numerous PATENTS.



Ore Crushers, H.R.M.'s New Patent Crushing Jaw EXTENSIVELY USED BY MINE OWNERS.

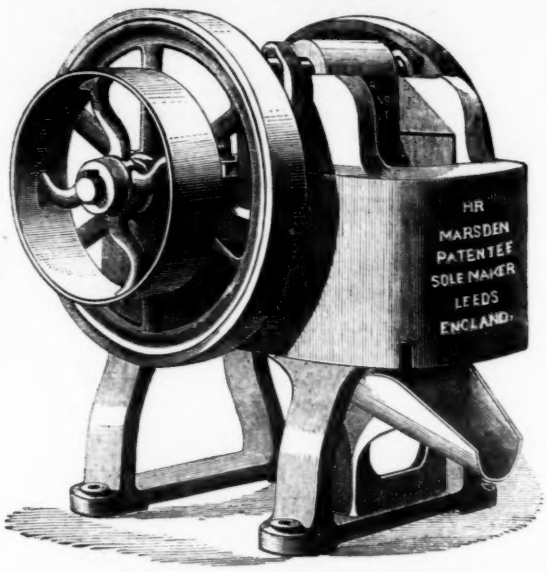
H.R. MARSDEN, LEEDS,

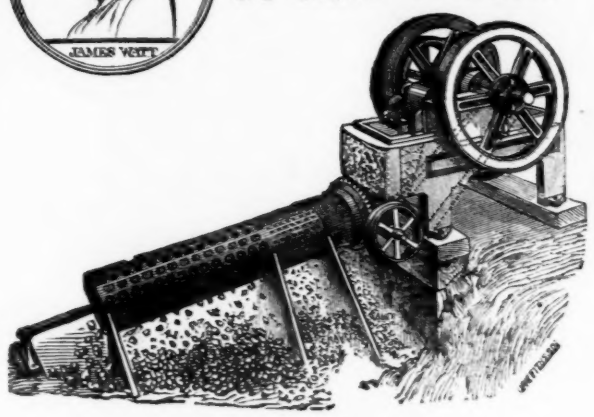
ENGINEER.

Mining Improvements

Revolving Picking Table.

1150 NOW IN USE.





FIXED MACHINE AND SCREEN,

Specially designed and largely used for

rushing Pyrites, Limestone, Cement, Coal, Rock s, &c.,

AT ALL THE PRINCIPAL WORKS IN THE KINGDOM.

Takes in 20 in. by 9 in., and is shown by TESTIMONIALS to be breaking from 1000 to 1200 tons per day of 10 hours, at

THREE HALF-PENCE PER TON.

FEW WORKING PARTS.
SMALL WEAR AND TEAR.
FREEDOM FROM BREAKAGE.

"The Machine is well designed, simple, but substantially made and is capable of reducing any material to fine gravel, such as copper ore, and is certainly preferable to the stamps in use for that purpose."—*Mining Journal.*

MACHINE FOR HAND OR STEAM POWER.

For making gravel for gentlemen's walks in parks and gardens, also for grinding emery, flints, fossils, &c., for pulverising silver, copper, and other ores; also gold quartz, and especially useful to chemists and metallurgists for sampling, as it is capable of pulverising the hardest material, and can be turned by one man with ease.

REFERENCES TO ALL PARTS OF THE WORLD.

SIMPLICITY OF CONSTRUCTION. EXCELLENCE OF SAMPLE. ECONOMY OF POWER

THESE STONE BREAKERS AND ORE CRUSHERS ARE UNIVERSALLY PRONOUNCED THE ONLY PERFECT SUCCESS.

For Catalogues, Tetimonials, &c., apply to the—

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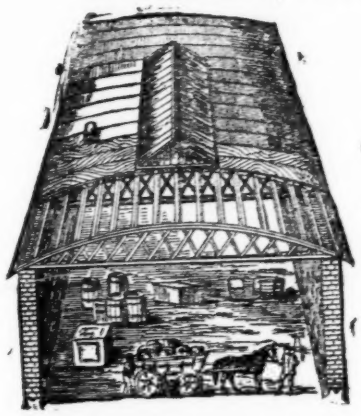
M'TEAR AND CO.'S CIRCULAR FELT ROOFING,



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GREAT ECONOMY
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CLEAR WIDE SPACE.

For particulars, estimates, and plans, address,—

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MANCHESTER;
OR
CORPORATION STREET,
BELFAST.

The above drawing shows the construction of this cheap and handsome roof, now much used for covering factories, stores, sheds farm buildings, &c., the principal of which are double bow and string girders of best pine timber, sheeted with ¼ in. boards, supported on the girders by purlins running longitudinally, the whole being covered with patent waterproof roofing felt. These roofs so combine lightness with strength that they can be constructed up to 100 ft. span without centre supports, thus not only affording a clear wide space, but effecting a great saving both in the cost of roof and uprights.

They can be made with or without top-lights, ventilators, &c. Felt roofs of any description executed in accordance with plans. Prices for plain roofs from 30s. to 60s. per square, according to span, size, and situation.

Manufacturers of PATENT FELTED SHEATHING, for covering ships' bottoms under copper or zinc.

DRY HAIR FELT, for deadening sound and for covering steam pipes, thereby saving 25 per cent. in fuel by preventing the radiation of heat.

PATENT ASPHALTE ROOFING FELT, price 1d. per square foot.

Wholesale buyers and exporters allowed liberal discounts.

PATENT ROOFING VARNISH, in boxes from 3 gallons to any quantity required 8d. per gallon.

HEPBURN'S
PUMP LEATHER
WATERPROOF

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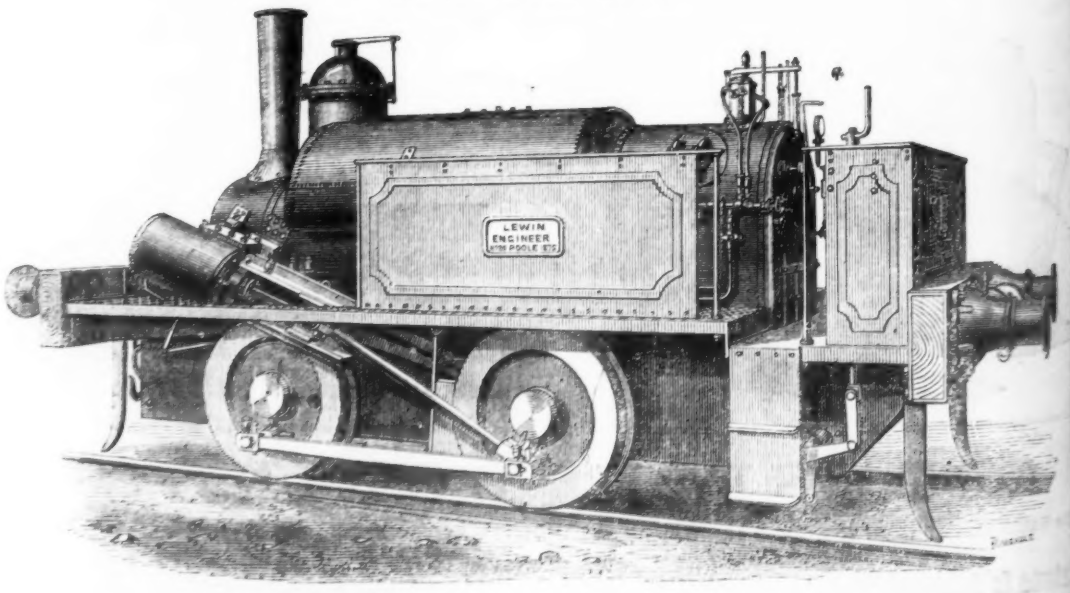

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